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World May 1983 85p

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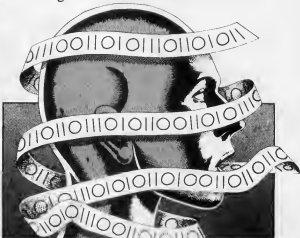
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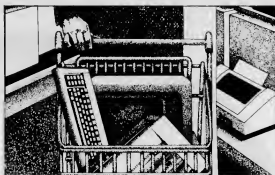
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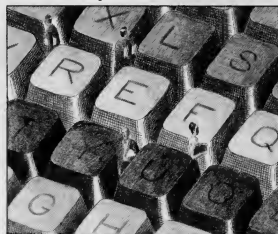
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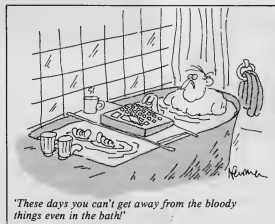
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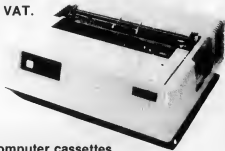
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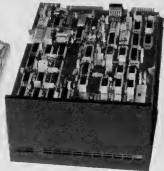
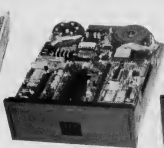
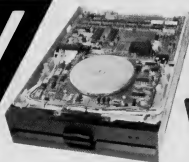
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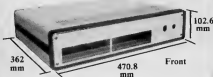
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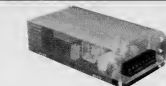
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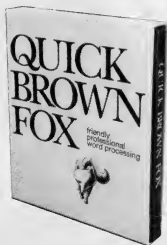


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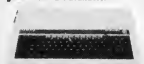
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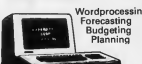
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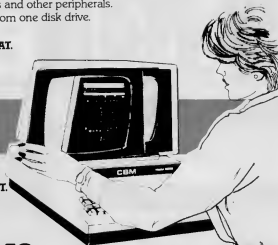
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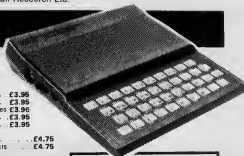
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SINCLAIR ZX-81

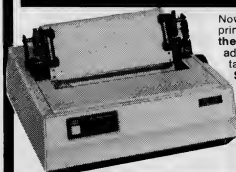
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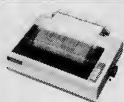
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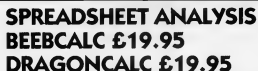
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	Datetime	Sales Control	Ambient	Invoices & Statements	Spread sheet Analysis	Cashbook Accounts	Word processor	Home Accounts	Commercial Accounts
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Deason TBA or Gde Sda	●				●			●	
Wezo (Tax +)	●							●	
Snitcher ZABT (Ise +)	●								
Growth Newborn	●								
Tech T19W KA	●								
Oubome I									
Shard KGBA	●			●				●	●
Sharp AEBOT	●		●					●	
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BBC metro model + C-TPV	●		●			●		●	

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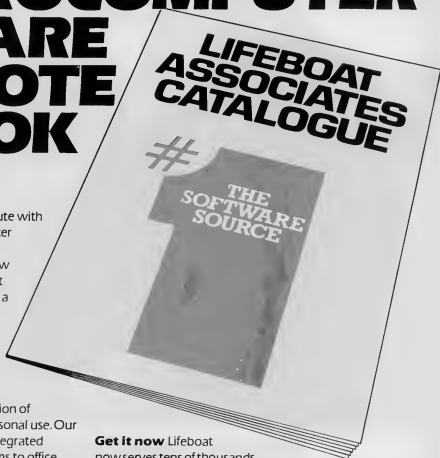
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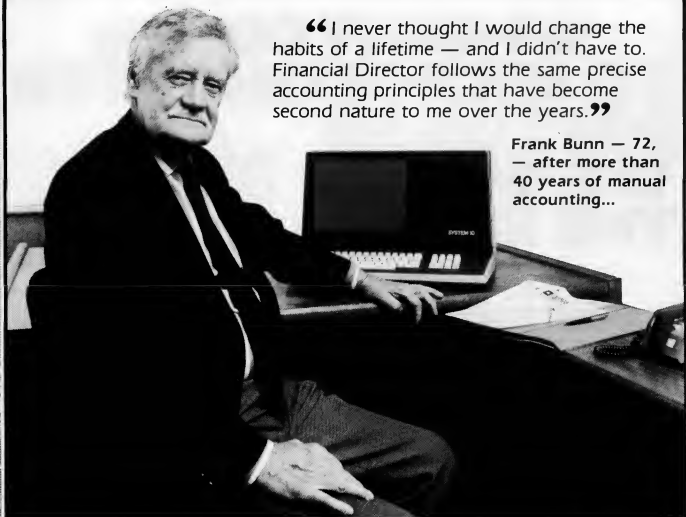
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Microprocessors: Concurrent 16-bit 8088 plus 8-bit 8085

RAM Memory: 256 Kbytes expandable to 1024 Kbytes

Integral Disk Storage: 19-Mbyte Winchester drive plus

1-Mbyte floppy drive

Storage Options: Up to 4 add-on Winchester drives plus

streaming tape backup

Communications: 4 workstation ports (RS-422-compatible),

plus 2 synchronous/asynchronous programmable RS-232

ports

WORKSTATIONS (up to 4)

Keyboard: Ergonomic, low-profile, 83 keys, 10 programmable function keys, 10-key numeric keypad (with cursor/editing functions)

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Printer: Bidirectional, 80 characters-per-second, friction and tractor feed

SOFTWARE

Operating System: User-friendly, multi-tasking, CP/M, MP/M, PC-DOS compatible

Languages: BASIC, COBOL, Pascal

Applications: Spreadsheet, Database, Text Processing

Communications

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means for you: Selling the Fourth Generation
quality and getting a "very attractive" profit.

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The Netherlands.



We speak your language – the language of the
Fourth Generation.

Profile of the Fourth Generation: TULIP System® I.

Specifications

Computer

Processor	8086, 8087 (opt)
Clock	8 Mhz
RAM	128-896 Kb
Serial I/o	RS 232
Parallel I/o	Centronics comp.
Interfaces	Hard disk, tape, lightpen
Fl. disk controller	8 inch + 5 1/4 inch
Buffered Keyboard	104 keys

Storage

Floppy disk	dual 5 1/4 inch; 1.5 Mb
Hard disk - fixed	5 MB, 10 Mb
- removable	5 Mb

Display

Format	80 x 25, 64 x 31, 40 x 25
Low res. graphics	100 x 160
High res. graphics	786 x 288 (opt)
Colour	8
Internat. char. sets	8 - softw. selectable

Please send me details of the dealership for
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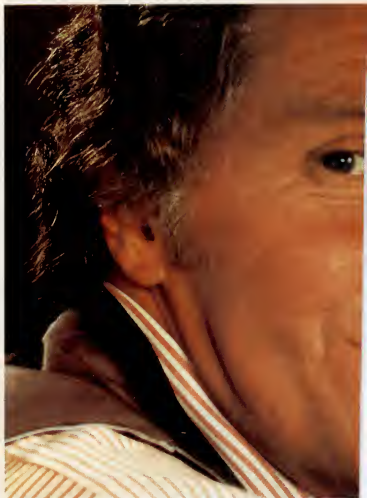
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Now there's the ZX Spectrum! With up to 48K of RAM. A full-size moving-key keyboard. Vivid colour and sound. High-resolution graphics. And a low price that's unrivalled.

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The ZX Spectrum incorporates all the proven features of the ZX81. But its new 16K BASIC ROM dramatically increases your computing power.

You have access to a range of 8 colours for foreground, background and border, together with a sound generator and high-resolution graphics.

You have the facility to support separate data files.

You have a choice of storage capacities (governed by the amount of RAM). 16K of RAM (which you can update later to 48K of RAM) or a massive 48K of RAM.

Yet the price of the Spectrum 16K is an amazing £125! Even the popular 48K version costs only £175!

You may decide to begin with the 16K version. If so, you can still return it later for an upgrade. The cost? Around £60.

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Your ZX Spectrum comes with a mains adaptor and all the necessary leads to connect to most cassette recorders and TVs (colour or black and white).

Employing Sinclair BASIC (now used in over 500,000 computers worldwide) the ZX Spectrum comes complete with two manuals which together represent a detailed course in BASIC programming. Whether you're a beginner or a competent programmer, you'll find them both of immense help. Depending on your computer experience, you'll quickly be moving into the colourful world of ZX Spectrum professional-level computing.

There's no need to stop there. The ZX Printer—available now—is fully compatible with the ZX Spectrum. And later this year there will be Microdrives for massive amounts of extra on-line storage, plus an RS232C/network interface board.



Key features of the Sinclair ZX Spectrum

- Full colour—8 colours each for foreground, background and border, plus flashing and brightness-intensity control.
- Sound—BEEP command with variable pitch and duration.
- Massive RAM—16K or 48K.
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The image shows the Atari 2600 control panel, which is a black plastic unit with a joystick on the left and 17 action buttons on the right. The buttons are arranged in a grid and are labeled with various functions. The labels are as follows:

- Top Row:** GRAPHICS, BLACK, DELETE
- Second Row:** POINT, CAT, FORMAT
- Third Row:** CODE, PEK, TAB
- Fourth Row:** VAL, LEN, VSR, ENTER
- Fifth Row:** J, L, K, L, F, M, SPACE
- Sixth Row:** INVERSE, SYND, SHIFT

The joystick is located on the left side of the panel, and a rainbow-colored cord is visible on the right side. The panel is shown against a dark background.

Designed exclusively for use with the Sinclair ZX range of computers, the printer offers ZX Spectrum owners the full ASCII character set – including lower-case characters and high-resolution graphics.

A special feature is COPY which prints out exactly what is on the whole TV screen without the need for further instructions. Printing speed is 50 characters per second, with 32 characters per line and 9 lines per vertical inch.

The ZX Printer connects to the rear of your ZX Spectrum. A roll of paper (65ft long and 4in wide) is supplied, along with full instructions. Further supplies of paper are available in packs of five rolls.

The new Microdrives, designed especially for the ZX Spectrum, are set to change the face of personal computing by providing mass on-line storage.

Each Microdrive can hold up to 100K bytes using a single interchangeable storage medium.

The transfer rate is 16K bytes per second, with an average access time of 3.5 seconds. And you'll be able to connect up to 8 Microdrives to your Spectrum via the ZX Expansion Module.

A remarkable breakthrough at a remarkable price. The Microdrives will be available in the early part of 1983 for around £50.



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The Spectrum software library is growing every day. Subjects include games, education, and business/household management. Flight Simulation...Chess...Planetoids...History...Inventions...VU-CALC...VU-3D...Club Record Controller...there is something for everyone. And they all make full use of the Spectrum's colour, sound, and graphics capabilities. You'll receive a detailed catalogue with your Spectrum.

This module incorporates the three functions of Microdrive controller, local area network, and RS232 interface. Connect it to your Spectrum and you can control up to eight Microdrives, communicate with other computers, and drive a wide range of printers.

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Critical review?



“The 16k Oric – fighting the 16k Spectrum – is £25 cheaper. It feels a good deal more ‘professional’ than the home-appeal Sinclair. Oric’s sound is extremely versatile, and well up to the standard of the £300 or £400 BBC microcomputer made by Acorn.”

WHICH MICRO?

“Oric will soon be selling a Modem so that Prestel will become available. Owners will be able to accept teletext – programs loaded straight down the phone line – eventually electronic mail could come into the home by the same route, and with the addition of a tape recorder the Oric with its Modem could become a telephone answerer and message taker.”

YOUR COMPUTER

“Instead of the Spectrum’s 28 look-up single-character error reports, the Oric has 18 self-explanatory messages. If you actually want to do computing, rather than just exploring the world of off-the-shelf games programme entertainment the Oric will be a better buy.”

WHICH MICRO?

“Oric was over twice as fast as the Spectrum. Surprisingly perhaps the Oric, which initially seemed only faster when performing the simplest of calculations, has come back to beat the Spectrum by a small amount. As the problems get more complex the Oric comes into its own. One final point – in entering the benchmark tests – the Oric was certainly the easiest to handle.”

WHICH MICRO?

“One good feature of the Oric is an on-screen reminder in the top right hand corner to show that you’ve engaged all-capitals mode. So much better than the BB’s variety of lights in the corner of the keyboard. The Oric is sound, simple to get along with and offers great expansion potential.”

WHICH MICRO?

“A good speaker and built-in noises get the Oric’s sound off to a good start. Typing Zap, Ping, Shoot or Explode produces convincing arcade game noises which can easily be incorporated into any program.”

YOUR COMPUTER

“The sound commands on the Oric 1 are, for a computer of this price, very sophisticated. Three music channels, and one noise channel, mean that you can program some fairly complex sounds.”

POPULAR COMPUTING WEEKLY

“Oric is everything you hoped it would be. Alive with colour, and zapping with built-in sound effects, the Oric looks like a match for any machine now selling for less than £200.”

YOUR COMPUTER

“This slope coupled with the design of the keys makes the Oric an easy machine to touch-type on. All keys have auto-repeat and there are four keys dedicated specifically to cursor control. It is certainly easier to type on than any of Sinclair’s offerings.”

YOUR COMPUTER

“When compared to the stogginess of the Spectrum’s keyboard this is certainly an improvement. I can’t see any Orics falling through bad assembly. If only the £2400 IBM were so easy to use.”

WHICH MICRO?

“The modem is certainly unusual in a machine of this price. Together with the other peripherals, when finally available, it should make for an attractive package for a small business... surely a match for machines costing much more.”

POPULAR COMPUTING WEEKLY

ORIC-1

The Real Computer System

ORIC PRODUCTS INTERNATIONAL LTD, COWORTH PARK, LONDON ROAD, ASCOT, BERKS

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We felt it was time we stopped telling you about ourselves and said a few words about the massive commitment which over 100 software organisations have made to the ACT Sirius 1. On these pages are just a few of more than 400 packages now available for the Sirius 1, Britain's best-selling 16-bit personal computer.

The packages range from traditional accounts programs to sophisticated computer-aided design systems and there is a whole host of software for specific industries and professions.

If you're looking for a computer solution to match your business requirements, then 'phone one of the numbers above, before you look any further. They're all convinced that the ACT Sirius 1 is the best machine of its kind in the country – and they have the software that will make it work for you. And if you don't see what you want, just clip the coupon for details of more than 400 products designed for the ACT Sirius 1.

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A new star is born



pulsar

16 BIT BUSINESS SOFTWARE



PULSAR business software is the creation of ACT – the company behind the Sirius 1 and recognised leader in 16-bit personal computing.

The new PULSAR range, developed by ACT at a cost in excess of £1 million, takes full advantage of the power and expandability of 16-bit computers.

It is inherently faster and more powerful than traditional 8-bit software.

And it is a true 16-bit range, designed and developed by ACT's own software engineers.

PULSAR offers more of all the key requirements in business software:

MORE PORTABILITY

Written throughout in machine-independent portable languages to protect your software investment.

LONGER PEDIGREE

ACT has more than 17 years experience in developing business software. Thousands of companies throughout the world use ACT packages.

GREATER INTEGRATION

All the PULSAR packages are designed to share information, avoiding duplication of files and eliminating re-entering of data.

MORE USER-FRIENDLY

ACT's unique UFO (user-friendly origination) routines allow even the inexperienced user to quickly and easily configure a PULSAR system to precise requirements.



For more information on the new PULSAR Range clip the coupon and return to

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BETTER TRAINING

Two training centres, in London and Birmingham are open to all PULSAR users.

MORE SUPPORT

A "hot line" telephone support scheme to instantly resolve any operating queries.

PULSAR SOFTWARE CENTERS

Only PULSAR is available through the unique network of PULSAR Software Centers. These are hand-picked computer dealers who handle a range of personal computers but who specialise purely in PULSAR to meet all business needs.

THE PULSAR RANGE

Sales Ledger	£195	Informer Database	£295
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**AVAILABLE NOW FOR SIRIUS –
IBM PC and DEC Rainbow
coming soon.**

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of the new PULSAR Range.

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SCI

GALAXY 2 COMPUTER SYSTEM



WHATEVER REQUIREMENTS YOU HAVE



GM813 - CPU/ 64K RAM Board

- ★ 4 MHz Z80A CPU
- ★ 64K Dynamic RAM
- ★ RS232C Serial Interface
- ★ Two 8-bit I/O Ports
- ★ 1200 Baud Cassette Interface
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GM812 - IVC Board

- ★ 80x25 Display Format
- ★ On-board Z80A Microprocessor
- ★ Buffered Keyboard Input
- ★ Programmable Character Generator
- ★ 160x75 Pixel Graphics
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GM 829 - FDC/ SASI Board

- ★ Single/Double density operation
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- ★ Industry Standard SASI hard-disk Interface



TWO SPARE SLOTS



The cost-effective solution to your computer needs for only **£1,495***

For just £1,495 the Galaxy 2 provides the basic requirements for a small business system:

- Central Processor Unit with 64K of RAM
- Twin disk drives (400K storage per drive)
- Keyboard and 12" monitor

But unlike many other small-business systems the Galaxy System is specially designed for expansion and flexibility to meet changing requirements. It uses the world's best selling micro processor, the Z80A, and is based on industry-standard 80-Bus boards. The business system uses only 3 boards in the 5 spaces available, so extra cards can be "plugged-in" to expand the system; for example to expand the memory, or to give a colour facility, or to develop the Galaxy for the particular requirements of education, research, software development etc.

It has a CPM operating system which gives access to the largest range of software available for any machine. In particular, Gemini can offer QUIBS; a small-business package developed especially for the Galaxy.

The Galaxy has industry-standard interfaces (parallel and serial), and Gemini Microcomputers can supply a full range of compatible hardware including a Winchester sub-system and printer.

The Galaxy offers the most cost-effective way of obtaining a basic unit which is capable of developing to meet your particular requirements; now and tomorrow.

Features include:

- Twin Z80 Processors
- 64K Dynamic RAM
- 800K Disc Based Storage
- 80 x 25 Screen Format
- Dual Printer Interfaces
- Modular Design
- Extra Disc Drives Easily Added
- Winchester Expansion Available
- Net Working System Available
- Additional Slots for 2 Cards
- 12" Green or Amber Monitor



*Price is exclusive of VAT



Gemini Microcomputers

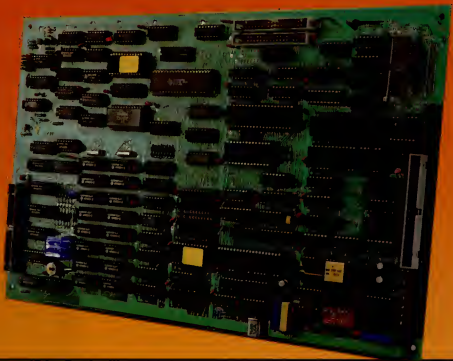
18 Woodside Road, Amersham, Bucks HP6 5EQ. Tel: (02403) 28321.

NEW!

Introducing the Micronix 80HD

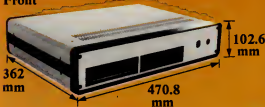
a complete microcomputer on a single board
with 'SASI' hard disk interface

- * Z80A 4MHz CPU
- * 64K or 128K RAM on Board
- * On Board 24 x 80 VDU
- * 4K System Monitor
Sockets for further 8K
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- * 4K Character Generator
Up to 64 Custom characters
- * Teletext Graphics
- * CRT Controller
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5¼" or 8" Drives inc. High
Density 77 track 5¼" Floppies
- * Industry Standard Hard
Disk Interface (SASI)
- * 2 Channel RS232c
- * 2 Port Parallel
- * On Board Real Time Clock/
Calendar with Battery back-up
- * External I/O BUS
- * ASCII Keyboard Port
- * Disk operating system
(optional): CP/M 2.2,
CP/M 3.

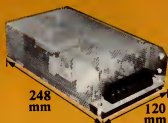


also available – for system builders

Front



Back



Low profile metal enclosure to house MICRONIX 80HD board, two half height 5¼" floppies (½ height floppies optional), a switch mode power supply for the complete system. The panels have cutouts for floppies, connectors and a fan (as illustrated). Thoughtfully constructed for easy accessibility. Cover and base grey/beige. Frame dark brown.

Switch mode slimline power supply model FEM 7030SS for a complete computer system enough power for MICRONIX 80HD, two mini floppies and CRT. Meets safety standards.
Input: 220/240V 50Hz.
Output: +5V @ 7A; +12V @ 3A
—5V @ 1A; —12V @ 1A
88 Watts

Micronix 80HD (Please state whether 5¼" or 8" board required)
64K £445 + £5 P & P (£15 overseas) + VAT
128K £499 + £5 P & P (£15 overseas) + VAT
CP/M 2.2 for Micronix 80HD £125 + VAT
CP/M 3 for Micronix 80HD £250 + VAT
Hard Disk utilities for Micronix 80HD £75 + VAT

Enclosure
for ½ height floppies £75 + £10 P & P + VAT
for ½ height floppies £80 + £10 P & P + VAT
horizontal mounting rails (set of four) £25 + £2 P & P + VAT
Power Supply £77 + £3 P & P + VAT



micronix computers Ltd
(formerly Vincelord Ltd.)

Suite 2, 26 Charing Cross Road, London WC2. Tel. 01-240 0213/0217. Telex. 295173 VILORD G

Although the NewBrain is conceived as a total system, the unexpanded Processor itself has a great deal to offer. It is available in two forms: Model AD, shown below, with a built-in line display; and Model A, without the line display. Both models can operate with a monitor or a television set.

MEMORY

- 24K bytes of ROM;
- 32 bytes of RAM, at least 28K of which is available to the user.

THE SCREEN DISPLAY

- 40 or 80 characters to the line – without affecting the 28K bytes of RAM at your disposal;
- 24 or 30 lines to the screen;
- well-formed characters, with true descenders;
- a full European character set;
- normal or reverse video, high resolution graphics on screen of controllable size, 256, 320, 512 or 640 horizontal resolution by 250 vertical lines;
- a facility to set up a “page” of up to 255 lines, with the screen acting as a “window” to display it;
- ability to maintain several such pages simultaneously, and to switch rapidly between them;
- text may be used on graphics screen as well as on parts of the video screen not used by graphics.

CHARACTER SET

- 512 characters, including the full ASCII set, all European accented characters, Greek and graphics symbols.

GRAPHICS

- 20 powerful graphics commands;
- all text characters usable on the graphics screen;
- variable-sized graphics screen, with the rest of the screen available for text – for versatility and to save memory.

SOFTWARE

Enhanced ANSI BASIC; screen editor (32 commands); mathematics package (10 significant figures); graphics commands.

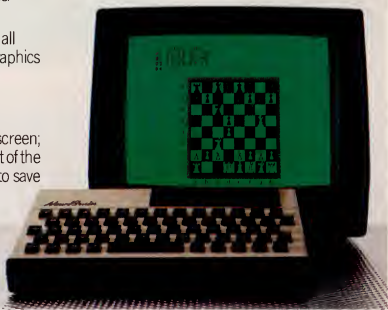
- a very friendly screen editor – a delight to use and readily adapted to text processing;
- arithmetic to 10 significant figures;
- very controllable output formatting of numbers – invaluable for accounting, statistics, and scientific applications;
- a powerful, much enhanced BASIC;
- a very flexible operating system, which allows any data stream to be opened to any device.

INTERFACES

- two tape cassette ports built into the processor unit;
- a built-in printer interface;
- a built-in communications interface (V24/RS232);
- a video monitor interface;
- a TV interface;
- an expansion interface for NewBrain system expansion modules.

KEYBOARD

- standard typewriter pitch, action, layout and size, with editing control and graphics keys.



“CP/M IS A REGISTERED TRADE MARK OF DIGITAL RESEARCH INC.

You can get everything in the box on the

If you understand the facts and figures on the left you'll soon realise that NewBrain has to be one of the most powerful micros around.

However, if you find the box on the left a little hard to follow, don't worry.

We've got over 120 dealers nationwide who've got all the answers at their fingertips.

Either way you'll discover that NewBrain is the kind of micro that will stop the competition getting a look in.

At £269 it starts off with twice as much memory as most of its competitors and can expand to over thirty times that amount. So there's no chance of being left behind in the micro race.

It comes with a very powerful language (enhanced ANSI BASIC) and it'll take CP/M; so it'll work on the same system as similar big business micros, giving you the capacity to use an almost limitless variety of tried and tested software.

But most of all NewBrain is a machine that can expand.

It's designed to take disks, printers and memory expansion modules (up to 2M bytes) plus anything else you'd expect a professional business micro to handle.

So, whether you understand the box on the left or not, pay a visit to someone in the know on the right.

They'll answer all your questions and give you a full demonstration.

NewBrain

Grundy Business Systems Ltd, Grundy House,
Somerset Road, Teddington.

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left from anyone in the box on the right.

Our spreadsheet systems But let's start with

Today, computers, micros and more importantly business planning systems are no longer considered luxuries.

They allow you to make better decisions by providing better information on budgeting, cash flow, project profitability, Acquisition Appraisal, Lease vs Purchase analysis and much more.

You stay one step ahead of your business and your business stays one step ahead of the competitors.

But which system should you buy? Surely no one system can meet the needs of all businesses?

Fortunately Comshare is not like most companies. We see the need for different systems to suit different people.

NEW USERS START HERE

PlannerCalc at £85.00* is now accepted as the first choice for people new to financial planning.

Designed for 8-bit micros, it boasts the kind of features that you'd expect to pay twice as much for. (Buy PlannerCalc's nearest rival and you'll have to.)

Unlike all other 'calc' products it allows you to enter calculations in a language you understand. Plain English.

For example:

LINE 1 SALES=100,150,175,210
LINE 2 EXPENSES=GROW 70 BY 15% FOR 4
LINE 3 NET=SALES-EXPENSES
LINE 4 CSALES=CUM SALES
COLUMN 5 YEAR=SUM OF COL 1 THRU COL 4

So it's much easier to use.

It uses the popular "spreadsheet" approach with a window that can be rolled in all directions.

Which means you can enter new figures and rules and

immediately see their effect on everything else in the model.

It comes with the best manual on the market and it's suitable for most micros with a TMCP/M 2.2 operating system, 64K of memory, giving at least 900 cells, minimum screen width of 80 characters and 2 floppy disc drives.

MUCH MORE POWER, NOT MUCH MORE MONEY

MasterPlanner is the most powerful spreadsheet system currently available with its increased matrix size, 2000-3000 cells on most 64K micros. (But at £245* it certainly isn't the most expensive.)

Consolidation of models, allows you to create separate plans for each department and then combine them into an overall company



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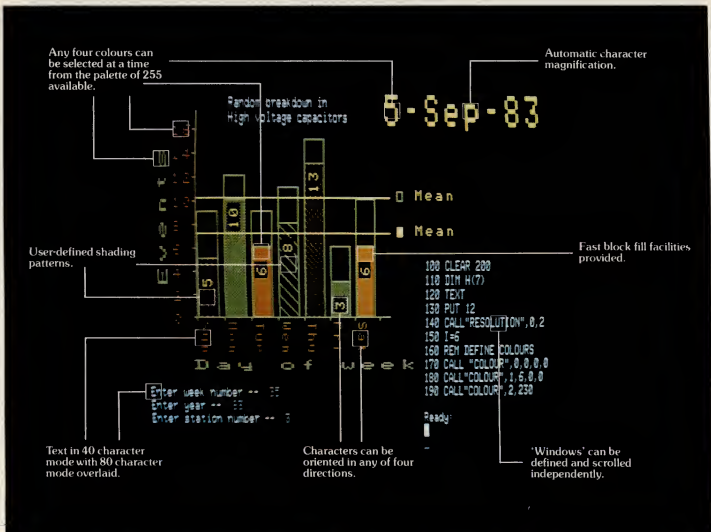
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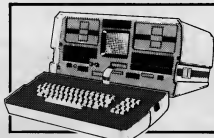
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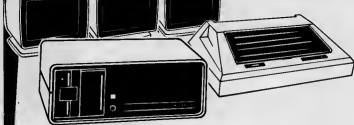
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SYSTEM SPOTLIGHT



COMART CP 520MP MULTI-USER SYSTEM PACKAGE

The CP 520MP is the new top specification multi-user introduction to the renowned, expandable Comart Communicator series. This true multi-user system allows one Communicator to be shared by up to five users, each using their own dedicated Z80A Processor and 64K Byte memory, whilst sharing printer facilities and data from common disk storage. The system includes Z80A slave processor cards, 64K Byte memory per user, 1 x 5 1/4" 80K Byte Diskette Drive Plus 1 x 20 Mega Byte Winchester Hard Disk and additional interfaces and multi-processing system software. Our special system package also includes

5 x WY100 display terminals and an Anadex 9501A Dot Matrix Printer Upgrade kits are available for single user stand alone Communicator Systems to be upgraded to full Multi-Processing facilities in a multi-user environment.

11,950
ex. VAT

SPECIFICATION: Comart CP520MP featuring CP520 Multi Processing Communicator System w/ 1 x Z80A male and 5 x Z80A slaves, 64K Byte main memory + 5 x 64K Bytes, 1 x 750K Byte Diskette Drive + 1 x 5 1/4" 20 Mega Byte Winchester Hard Disk, 12 Serial system software. Package includes CP520MP with 5 x WY100 Display Terminals and an Anadex 9501A Dot Matrix Printer

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Just as important, you will have the undivided attention of computer experts. Our staff have been trained on all our machines and peripherals and can give you sound advice and assistance, with complete confidence.

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If you're one of those people who knows how many pecks there are to the bushel and remembers decimalisation as if it were yesterday, we've got some important news for you.

A lot has changed since your schooldays.

New maths, Venn diagrams and the decimal point have come onto the scene.

Now computers are here. And like it or not, they're here to stay.

So much so that they're now an approved part of

primary and secondary education (approved by the Department of Industry no less).

And in the future, the emphasis is going to shift more and more towards computer technology and further away from traditional schoolroom aids.

So the money you would normally have spent on a good set of encyclopaedias for your children would now be more effectively spent on one of the new breed of personal computers.

Which is why it's worth doing your homework on NewBrain.

Quite simply, it is more powerful, has more possibilities and allows for greater expansion than any other personal computer in its price range. (It costs £269.95*).

Technical Specifications

The NewBrain is a fully specified professional computer built to the highest standards of engineering and reliability. Chosen by leading OEM suppliers. Designed to facilitate easy expansion for use with the CP/M operating system, and the addition of 5 1/4" flexible and Winchester disks, 12" green phosphor professional standard monitor 80 cps professional quality dot matrix printer with pin addressable graphics.

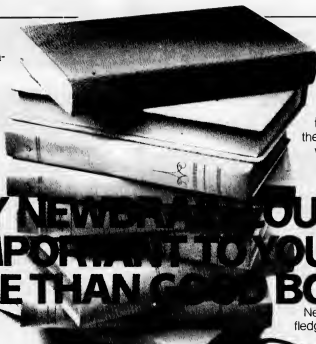
280K cpu and COP 4200 input/output micro-processors
32K RAM expandable to 2 Mbytes 28K ROM Dual Cassette Ports UHF TV port CCITT Monitor Port Video 40/60 Character x 25/30 lines 256/320/512/640 x 250 Pixels Expansion Port V24 Bi-directional Port V24 Printer Port 16-character display

Software
Enhanced BASIC (ANSI x 3.2/78) Independent Operating System (12 device drivers) Multi-Page Screen Editor (32 Control Commands) Maths (10 Significant Figures) Graphics (Absolute & Relative Panning, Line & Arc Drawing, Shading, 20 English Language Commands)

Take its memory for a start.

It comes with 32K RAM as standard (most competitors expect you to make do with 16K).

And its 28K ROM (the computer's pre-programmed memory) means that you get software packages like screen editing, maths, BASIC and graphics built in



programs all available at a small extra cost.

And the list is growing. And if the kids ask you about games programs, don't worry, we've got enough of them to keep you all happy for some time to come. (Even better, get them to write their own games, that way they'll be learning at the same time).

If you think £269.95* is too much to spend on a computer for your children, you've

WHY NEWBRAIN COULD BE MORE IMPORTANT TO YOUR CHILD'S FUTURE THAN GOOD BOOKS

missed the point.

NewBrain is not a toy, it's a fully fledged business machine that can work for you at the office and at



home, take care of things on the domestic front as well as prepare you and your children for a world where the language of the computer is the language of the future.

With the NewBrain you'll receive a comprehensive instruction manual and Beginners Guide with 23 programs on cassette, as well as a complete list of all the

software and peripherals currently available.

So if you'd like to know more, simply ask for a brochure and we'll send it by return of post together with the name and address of your nearest stockist.

After all, the price of a stamp can't be too much to pay for something as important as your child's future.

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(the opposition usually consider these as optional extras).

Its graphics and video capabilities are second to none and its full-sized keyboard (just like the one on a typewriter) means that even the stickiest little fingers won't have any trouble getting to grips with its advanced capabilities.

As we said, when it comes to expansion, you'd have to go a long way to find a machine with the same possibilities.

With the memory expansion modules you can build all the way up to a staggering 2M bytes RAM (a figure that wouldn't look out of place on a computer costing ten times as much).

There are printers, monitors, floppy disc drives and 5 1/4" Winchester drives (don't worry if these terms seem a little unfamiliar at the moment, before long they'll be part of your everyday language).

And, of course, there's an extensive choice of optional software packages.

There are language learning programs, such as French and German vocabulary, data base programs and accounting

What do Miss World and the new Epson printers have in common?

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World beating Miss Dominican Republic, below, sits with two of her counterparts. For beautiful styling that is. And a lot more besides. Which brings us neatly to the two new printers from Epson. Namely, the RX-80 and FX-80.

Faster

The RX-80 and FX-80 print at speeds of 100 and 160 characters per second, respectively.

More Value

Yet both machines are better value than their predecessors. With features like dot addressable graphics, standard Centronics compatible interface and optional RS-232C and IEEE interfaces.

The FX-80 Printer takes a lead with the addition of various extra built-in features. And we've designed the RX-80 with tractor feed for perfect alignment, and the FX-80 with both tractor and friction feed.

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byte

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We designed the Elite Three to give you a hard disk capacity with all the advantages of a minifloppy system. The double-sided head operates on 80 tracks per side, giving you a capacity of 652K bytes. It would take 4 1/4 Apple's to give you that.



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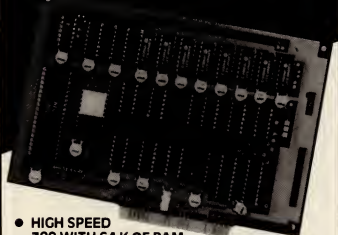
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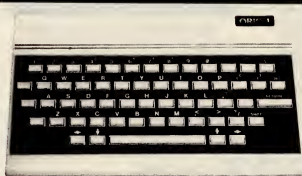
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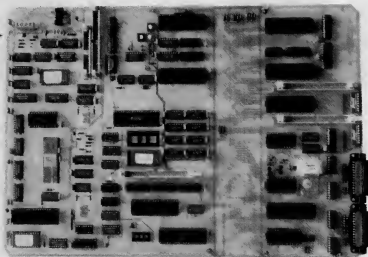
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Word Processing				
WORDSTAR	MicroPro	□	●	*
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EASYWRITER II	IUS	□	●	*
EASYSPELLER II	IUS	□	●	*
Data Bases And File Management Systems				
DATASAR	MicroPro	□	●	*
DBASE II	Ashton-Tate	□	●	*
EASYFILER	IUS	□	●	*
FMS-80, 81, 82	QJR Assoc	□	●	*
INFOSTAR	MicroPro	□	●	*
PERSONAL PEARL	Pearl Software	□	●	*
REPORTSTAR	MicroPro	□	●	*
RESCUE	MBS	□	●	*
Business Systems, Financial Planning, Accounting				
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EASY PLANNER	IUS	□	●	*
MULTIPLAN	MicroSoft	□	●	*
SAPPHIRE MARS	Sapphire Systems	□	●	*
SUPERCALC	Sorcim	□	●	*
MILESTONE	Organic Software	□	●	*
GBS/(General Business System)	ByteSoft	□	●	*
ISL (Integrated Stock & Ledger)	ByteSoft	□	●	*
Statistics				
MICROSTAT	Ecosoft	□	●	*
Training Packages				
HANDS-ON CP/M	MicroCal	□	●	*
HANDS-ON COBOL	MicroCal	□	●	*
WP WORKSHOP	MAC	□	●	*
FLIGHT SIMULATOR	MicroSoft	□	●	*
Languages				
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BASIC INTERPRETER	MicroSoft	□	●	*
BAZIC	MicroMikes	□	●	*
CBASIC	Digital Research	□	●	*
CBASIC COMPILER	Digital Research	□	●	*
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LEVEL II COBOL	MicroFocus	□	●	*
MULISP/MUSTAR	MicroSoft	□	●	*
MUMATH/MUSIMP	MicroSoft	□	●	*
PASCAL/MT	Digital Research	□	●	*
PASCAL/MT & SPP	Digital Research	□	●	*
PL/I	Digital Research	□	●	*
XBASIC	Xitan	□	●	*

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EDIT	MicroSoft	□	●	*
BT-80	Digital Research	□	●	*
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SPP	Digital Research	□	●	*
WORDMASTER	Digital Research	□	●	*
XASM18 (1802)	MicroPro	□	●	*
XASMF8 (F8/3870)	Avocet	□	●	*
XASM65 (6502)	Avocet	□	●	*
XASM68 (6800/01)	Avocet	□	●	*
XASM48 (8048/8041)	Avocet	□	●	*
XL785	Digital Research	□	●	*
ZSID	Digital Research	□	●	*
Operating Systems				
CP/M	Digital Research	□	●	*
CP/M PLUS	Digital Research	□	●	*
CP/NET & CP/NOS	Digital Research	□	●	*
MP/M II	Digital Research	□	●	*
CONCURRENT CP/M-86 (IBM PC)	Digital Research	□	●	*
Utilities				
COPYALL	MicroMikes	□	●	*
DESPOOL	Digital Research	□	●	*
FILESHARE	MicroFocus	□	●	*
FILESTAR	MicroSec	□	●	*
MUCOPY	Wheatcroft Hards	□	●	*
SORT	MicroSoft	□	●	*
SUPERSORT	MicroSoft	□	●	*
SUPERVYZ	Epic	□	●	*
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BSTMS	Byrom Software	□	●	*
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GSX	Digital Research	□	●	*
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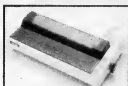
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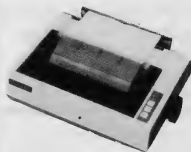
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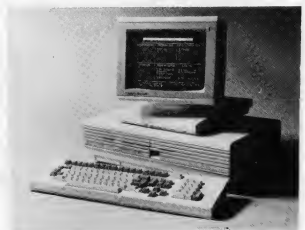
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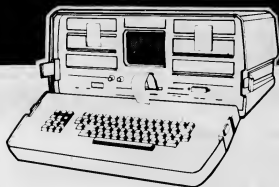
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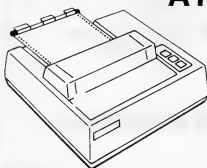
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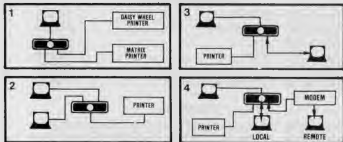
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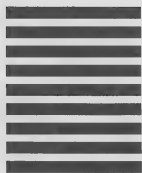
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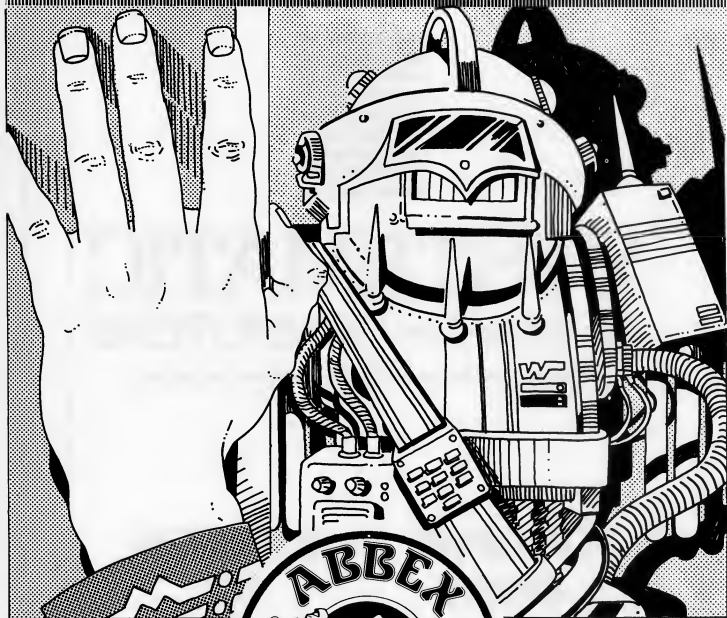
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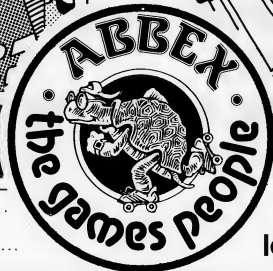
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Guy Kewney delivers his monthly package of micronews.



Fearful motives

The fine, small print at the end of the most impressive micro launched last year is the astounding revelation that you cannot format diskettes on the DEC Rainbow. Nor, for that matter, can you format diskettes on the British CP/M systems sold under the name Andromeda.

This is an astounding development—it is as if Parker was to launch a new ball-point pen that would write only on Parker paper.

Not being able to format diskettes means this: you can't just buy a box of blank diskettes from the nearest shop. You have to get pre-formatted ones from your supplier.

The news wasn't released at the same time as the rest of the information, on either system. Had it been, the critics would have been full of scorn. It is possible both machines would have been dismissed as oddities.

To explain: the point of using CP/M—almost the only

point of using CP/M—is the fact that it varies very slightly from one machine to another. Thus, in theory at least, it is very easy to get exactly the program you want, because it is bound to be there, inside the CP/M canon.

There are two reasons why this doesn't mean what it should mean. It should mean that any CP/M program is yours for the asking. But in fact, since your particular CP/M machine has the "wrong" disk format, it means that the software producer has to produce a version on your diskette. And since there will be some slight changes needed, this takes him a couple of months to do.

That's the first reason you can't just buy a copy of the latest (whatever it is) program.

The second is the fact that, officially, making your own copy of the program to try it out is illegal. Naturally, this fact doesn't stop people copying other programs and trying to run them, but it does

stop them talking about how they did it.

By supplying pre-formatted blank disks, Andromeda's supplier (ITCS) hopes to prevent software copying. It also hopes to ensure that its customers use only the best quality diskettes, because they will supply only the best, under their own label. DEC says it too, has the customer's best interests in mind, and will make sure its users never suffer from grotty diskettes.

At this point most people I discussed the idea with, interrupted the conversation to do a convincing imitation of a horse laughing.

At the risk of being considered hopelessly naive, I have to admit that I believe both ITCS and DEC when they speak highly of their own motives. They really do intend to buy the best magnetic disks, and supply them to their customers. And I honestly do not doubt their sincerity.

What I doubt is whether anybody else will believe them. I think the horse-laugh will be universal.

And as for protecting software, it just won't work.

The first thing a really clever scheme for making diskettes uncopyable does is create a market for really clever programs to get round the scheme.

The second thing it does is to prevent people trying out new programs. And if they don't try them out, they don't buy them. And only a twit would pretend you can really try a program out by going into a centre for testing programs and sitting in front of a machine for an hour or so. You have to use it in your own office, feed your own data in, try to get it out again, and find out what it can't do that you can manage without, what it will do that you didn't realise you needed, and how reliable it is.

Few people who try it out buy it. Many of them might have done, if the software had been available for their machine in their local shop—but it wasn't, because the software house didn't know how to get it distributed properly.

But a lot of the ones who didn't buy it weren't going to. They didn't have the money. And they didn't like the program all that much, either.

It is easy to understand why software producers are afraid of releasing unprotected software.

But fear is a bad guide to action. Giving software houses copy protection is as much sense as giving American citizens the right to carry guns because they're afraid of being mugged. All it does is make sure that every mugger has a gun, thousands of people die each year with bullets in them, and if you walk down the streets, you are picked up as evidently either crazy, or a mugger yourself.

Both companies assure me that their policy on diskettes will not discourage sales. DEC points to the current rage and frustration amongst people who want to be dealers, just because they can't get the things until mid-April (DEC won't say what the delay is caused by, but I gather it is faulty diskettes). And ITCS points to a contract to supply 500 of its portable Zita models to YBA Kanoo group in Saudi Arabia.

All I can say in reply is that I only found out about this little detail when a friend rejected my suggestion that he seriously consider the Andromeda range, just because he had found out he couldn't buy ordinary diskettes.

And I wouldn't buy a system like that, either.

Sensible networking

Sintrom's decision to launch two circuit boards to do the job of linking microcomputers may mark the beginning of sensible networking, even though Sintrom is using the Ethernet system.

The thing that makes Sintrom's little boards different from other Ethernet-labelled products you may see advertised is that you don't have to buy a special Ethernet computer.

The boards will plug into any CP/M system using the standard \$100 cards, and providing you have enough of these lying around (there is a minimum) to make a network, it will become an Ethernet network.

The cost, per machine, is around £800 extra.

However, any earlier scepticism you may have noted in this column about Ethernet as a micro solution is not dissipated by the Sintrom product. This one works, but that doesn't mean that you or I would be able to use it, any more than we would be able to buy a naked CP/M and install it on our systems.

But it does mean that software houses who want to sell software to people who have Ethernet networks, next year, can buy this and start putting the handles and starter-pedals on it.

Details on (0734) 875464.

In-flight wp

Word processing, using a four-line display only 18 letters wide, is a bit of a challenge. But the gauntlet has been

Gold Star for Comet

A month before Telecom (our old Post Office as was) was due to launch its Gold electronic mail service, and decided to postpone the announcement, a rival service has been started up by (of all people) British Leyland.

BL Systems has been running an internal electronic mail system for some time, and it isn't any secret that several people outside the company have been logging on and swapping messages.

The system is called Comet, and travel people use it a lot

(officially) and enthusiasts use it too (unofficially).

Now, they are legally entitled to do so, because the Government has approved Comet as a "value added network" for use between companies, as well as inside them.

For details of the charges and the way to join (all you need is a micro, a modem, and some suitable software) contact the company in Redditch, Worcs on (0527) 64274.

seized with the production of a word processing program for the Epson portable HX-20, called Intext, by Talbot Offset.

Talbot makes quite comprehensive claims for the system, saying that (since you can put up to 6 Kbytes into memory) the tape (rather than disk) storage of the Epson, doesn't matter. You can even drive an Epson printer direct.

The idea is not that your portable micro becomes the heart of a full-blown office system, even though there isn't anything to stop you doing this except good sense.

Instead, the text that you prepare (on the aeroplane, or in the loo) can be piped down the RS-232 cable, into a system which is better at large-scale text viewing, editing and printing.

There is also a plan to attach a portable acoustic modem, which will take its power from the Epson, and transmit the text down the phone line to the office system.

This system, one of which is shortly going to be available from Bencom, will cost just over £200.

Intext will cost £36.00.

Details from Talbor on (0202) 519282. Bencom is on 01-940 1386.

File on BBC

The first attempt to put enormous hard-disk capacity onto a BBC microcomputer has been made by Geophysical Systems Limited, in Andover.

The word "enormous" was chosen with some care, because GSL has not exactly dithered about what size of disk to use. It has interfaced four drives, each of 85 megabytes, and says that it is prepared to supply the whole package, 340 megabytes, interface and all.

The project is just emerging from the laboratory, with the first order received very recently, so potential purchasers without some expertise should probably be cautious at this stage.

According to GSL, "a provisional filing system is currently available as a basic program providing an elementary capability for file-handling and cataloguing".

This program will be expanded by production of a



You keep your diskettes, like everybody else, in a box. The question is, how do you find the diskette you want, in a hurry? One answer is this Safer system, which hangs the envelopes up like files in a drawer, and locks them in position with a number on each, and a little card-index system at the front. That way you are forced to leave the envelope in the box, in the right order. And I know I wrote about it before, and we're so overwhelmed with stunning pix but I couldn't resist this one that MC2 sent me... contact them on 01-540 9370.

machine-code version, on permanent Eprom memory chips.

System builders who wish to join in this project at an early stage and also want to haggle about things like the local Econet network interface, and the price, should contact GSL on (0264) 58744.

Portable tape save

You can now store information in your nice portable Epson HX-20, because Bits and PCs has launched a £40 program called Deskdata, which does it.

The company describe the product as "taking the drudgery out of any card filing system" and says that it "includes mathematical functions".

However it does have its own form of drudgery: since nobody has yet invented a portable disk, this program uses the Epson's tape cartridge.

So the records are kept in memory, until they are saved to tape in sections, when memory is full.

Details from Leeds (0532) 458877.

Expert shift

Any information you have going back to the days when there was a computer called the Exleigh Expert (which was generally admired) should now be updated.

Change the reference from Exleigh to Sord, because Sord is now seriously selling the machine itself, through 16 (at last count) dealers, rising to 40, they were hoping, by the end of March.

The list of dealers is

Watch Out! Hot micros

It is hard to imagine what a thief does with a stolen computer, and were it not for the arrival of two sad announcements of such thefts, most people would agree that they aren't particularly "fenceable".

Perhaps it is hard to resell "hot" micros, but that isn't stopping some optimists. Lincoln College of Technology

reports the theft of a Commodore 8096, a disk, an Epson printer, and an oscilloscope.

Another burglary is the one at London dealer 01 Computers, where they lost eight Osborne micros, 14 printers, 17 monitors, parts of an Olivetti, and a selection of other goodies "including a two months' supply of fresh

coffee," observes an indignant Bob Rothman.

Should anybody ask your advice about the offer of a cheap Osborne, warn them that the thing will need upgrading soon, and that Osborne has the serial numbers. Then get onto Rothman and claim the "substantial reward" offered.

available from Sord at Samuel House, St Albans Street, Haymarket, London SW1Y 4SQ. Phone 01-930 4214.

Pricey tricks

Alert readers will notice a certain amount of variation in the price, as quoted in one magazine or another, of both the IBM Personal Computer, and the Apple Lisa.

Confusion on pricing on the Apple arises because the company hasn't announced a

UK price. It said "Lisa will cost \$12,000 in America," and left the rest to our imaginations.

I notice that my references last month to a £9,000 UK price have been carefully adjusted by our production team to £7,000. This is admirable optimism, totally out of keeping with either exchange rates, or Apple's past practices.

Apple has never sold things cheaper in the UK than in the US, and has made no predictions of a change in policy. At today's varying

Dragon demon

We have sad letters from two readers who sent for Dragons by mail order from one of our advertisers, but didn't get them. In order to protect the rest of you from any other crooks, please would anybody who has been ripped off let us

have full details.

The crook is NOT one of our current advertisers.

We will obviously be working with other publishers and the Computer Retailers' Association to ensure that this doesn't happen again.

rates, the price would be £8,000, and Apple is most likely to charge extra for a UK power-supply, video display, and so on, not to mention VAT

and import duties. If it sells for under £8,500, I will eat my hat, and if the price is set at £10,000, I will not even raise an eyebrow.

Confusion on the price of the IBM, however, lies in the fact that the company, like Sage, quotes a price for a system with 64 kbytes of memory and only one disk. When you see prices like £2,400, you may have discovered somebody discounting - but check. You are going to need to spend £3,100 for a working system, and IBM doesn't like its dealers to make cut-price offers.

It really is time that the industry quoted two prices, absolutely as a matter of habit. One should be for a "minimum" box - just the processor and whatever simply can't be taken out of it (the VIC and the power supply, the Apple with no special circuitry, the Lynx with just its cables and transformer).

The other should be the cost of a system with keyboard, screen, two disks and disk operating system, 64 kbytes of memory, a printer interface, and a year's maintenance. That should be regarded as a "standard" system.

And all prices should INCLUDE VAT.

Opinionated machines

It isn't true to say that the only thing going for Olivetti and its M20 micro is the fact that its Basic interpreter ran the fastest in our PCW Benchmark summary.

The company also has going for it the fact that Clive Sinclair likes the M20.

This alone will not be enough to overcome the awful impression made by its thoroughly nasty advertisements, which show several microcomputers all purportedly and solemnly agreeing that the M20 is the best.

I prefer to think of the ads as a self-send-up, along the lines of the current Guinness campaign (that shows somebody doing a drink test of G. vs bitter, and not being able to see the pump, so not knowing that the black one is the G.) - but from talking to Olivetti, I have reluctantly come to the conclusion that they think it is a serious campaign.

The program which the machines run is nothing like the program which you may have thought you see running on them, on the TV commercial.

All the program does is to summarise Olivetti's opinion of the IBM, the Sirius, the Apple III, and the Pet, compared with the M20. "Fed with true facts, computers are impartial," remarks the advert - but the theory that opinions count as "true facts" is new to me.

Here is what Olivetti actually fed into those "impartial" machines.

First, it awarded itself 30

marks for having "true 16-bit power" rather than the 8/16-bit power of the IBM and the Sirius, which only got 20 marks. The Apple III and the Pet got only 10, because they were 8-bit. (The Olivetti, therefore, is three times as good as the Pet and Apple, when it comes to "bit-power".)

Second, it awarded itself 10 points (and the same to all the others except the Pet) for having high-resolution graphics. The Pet had graphics, so it got 5 points, but they weren't high-resolution graphics. (Only half as good.)

Then it awarded itself (and the Apple and the IBM) ten more points for having colour. Sirius and Pet got only five. (Colour is twice as good as monochrome).

Finally, it noted that the Sirius had nearly twice as much "memory" at 896 kbytes than the M20 and the IBM at just over 500 kbytes - but reckoned that the double capacity wasn't worth that much more. Probably only 30 points for Sirius as opposed to 23 points for themselves. And of course the Apple II only got 16 points, and the Pet got nearly 10 points.

They then decided that these scores should be added up, and the machines should be compared by subtracting the value, in seconds, of the Benchmark timings published in PCW.

You might be forgiven for asking why extra bits are so important, if it isn't simply that they let you plug in extra memory and run faster programs. Don't ask Olivetti. Colour bits are worth points

AND they make the machine faster. And if they give you extra memory, that's not really so much.

So the Olivetti scored 72.63 points, minus 11.5 seconds = 61.1274 points. The Sirius scored 64.93 points, less 24.8 seconds = 40.1333.

And, final absurdity, the Pet 8096 got a negative score. It scored 29.8 points, less the 34 seconds taken to run the benchmark = minus 4.2024.

The decimal points were supplied by the computer.

You might think that when the minus score came out, somebody would have twigged "Hey, this must be a measurement of nonsense, because we've just proved that having a Pet is a handicap in running programs" - but no.

I'd quite like to run a little competition for more meaningless measurements. You know, twice the area of the keyboard, divided by the number of dots on the screen, less the number of printer-sockets on the back all to the power of an arbitrary score for quality of plastic casing.

Better yet, how about this: award yourself 0.01 points for every commercially available program that runs on the M20, Olivetti. Then multiply that figure by (1.5 to the power O/S) - and O/S is calculated by taking the number of operating systems that run on your machine and also on anybody else's.

Then subtract something like ten points for insulting the intelligence of your customers. What! You mean that gives you a score of minus ten! oh, surely not?

IBM goes Arabic

So you have a wordprocessing computer: can it do Arabic words, too? There is now a version of the IBM Personal Computer which is sold by Aptec, modified to show Arabic script with our own letters, both on screen and on paper.

The package which produces the mixed squiggles is known as Arabstar.

Aptec provides a specially modified keyboard, too. And from the brochure sent with

the announcement it is clear that the screen can show mixed Arabic and English letters.

If only these people knew how useful a photograph would have been to illustrate this news item! And the rubbish we have to print sometimes, just because we need a few pictures on the page. . . .

Aptec is the trade mark of Appropriate Technology, on 01-625 5575.

Window on data

The database program (stores information and digs it out again when you want it) Sequitur looks like a word-processing program (you sit in front of it, typing). It means that anybody with a Fortune 32:16 can start putting information in, without worrying whether they understand the "data structure" or "key search algorithm" or "record format". The program is now available in the UK through Tetra Data Systems of High Wycombe.

"The screen of the computer provides a 'window' into the selected file so that users can manipulate data in exactly the

Dicey downloading

The Slowloader is a cassette-based program designed to enable you to load a ZX81 program directly onto a Sinclair Spectrum.

There are not only differences between the Basic languages of the two machines, but they store their programs in a totally different way. Slowloader has such a lot to do that I asked a Sinclair enthusiast to test it out more fully than normally for this column.

His report shows that there is no simple way of overcoming the shortcomings of cheap tape recorders. Both Sinclair's whistle notes on to tape—one for dots, and another an octave higher for dashes—and have some skill at working out which note is which on replay.

But setting up a tape recorder so that the ZX81 can make sense of the whistling is a crucial and critical thing. About all you can be sure of,

when you have done it, is that the next ZX81 you find will need a different volume-control setting, or a different tape.

He therefore recommends using one channel of a very good cassette recorder for the purpose. Slowloader then loads much more easily, and gives instructions for loading the ZX81 tape, and saves them on to the same tape drive. After that, they can usually be safely saved and loaded on the ordinary battery portable.

The new version of the program is heavily altered. FAST and SLOW instructions are edited out, and the program does its best with the graphics symbols that are not common to the two machines—but even then, character codes, plotting instructions, and some of the TAB commands will have to be edited.

And obviously, PEEK and

POKE instructions have to be carefully examined and rethought. Slowloader recommends that programs which POKE to the screen be rewritten using PRINT AT.

My enthusiast friend considers that at £10 the program isn't cheap—but suggests that it could be worth the money to somebody who laboriously typed in a great many text-based programs on to an 81, and now has moved up and wants them all on the Spectrum.

"If you can see your way through a program listing and understand what it is doing, then it will probably need very little change before (or after) Slowloader has processed it. But if you can't follow it, you will probably have trouble."

Details from East London Robotics, now at No 11 Gate, Royal Albert Dock, London E6. Phone 01-474 4430.

way a secretary composes letters on a word processor," says Tetra. "Even the database commands are visual, and quickly assimilated by non-

computer professionals."

Apart from the question of what a professional non-computer might be, that leaves only the price. It can't be low, because, by press time, Tetra still hadn't told us what it was. Ask them on (0494) 45200.

computer, but at least one notices the ad.

The other one just says that "the Samurai" home computer is coming" and adds, tersely, "Samurai is a trademark of Samurai Worldwide Ltd."

No, they are not the same machine. No, they are not the same company. No, the deal has not been worked out between the two companies in advance. Yes, it is a terrible shame one can't buy shares in the solicitors' firms involved, isn't it? Watch this space.

Eastern Mystery

Attentive readers will have noticed advertisements for a machine called the Samurai.

One of the adverts says that you can buy it, and shows a picture of an incredible little mediaeval warrior. It may not, of course, be entirely clear to you why a half-pint Oriental person with a curved sword would make you want a

Faire

The London Computer Faire is moving from its North London Poly home, to the Central Hall, Westminster.

At press time, the organisers were beside themselves with

Spreadsheet taped?

Saxon Computing has a spreadsheet for the Spectrum. It is called Flexicalc.

This product "is in regular use in real planning situations," says Saxon ternly. "We shall shortly be releasing 'Consolidation' and 'Report Generator' modules, price at

£6.95 for the two—these will work with files generated by Flexicalc."

The central module costs £10. Unless you actually like file handling on audio tape, stick to that.

Details on (0401) 50697.



The immaculately drawn metal section shown here looks as though somebody used a Tektronix display.

They didn't: they used the Riva TK1024 graphics terminal, which can be connected to an IBM Personal Computer.

The terminal costs £4,600. That may sound expensive, but only if you've never studied a Tektronix catalogue.

Details for those who have, on (04862) 71001.

anxiety because the hall is "dry" and the Real Ale Bar is a tradition which they are anxious to uphold.

A new tradition, however, is the scrap computer stand, from which people can escape with keyboards, disk drives, displays, and other components or sub-systems of defunct micros.

And the normal collection of interesting hardware and software for schools, and similar purposes, will be there.

IBM net

Another network for the IBM: after Zynar's Plan 440 that links them to Apples, Chatterbox has announced an Advanced Electronic Office Network (Aeon) which links them to its own Aeon workstation.

The network controller that the system uses has a big (40, 80 or 160 megabytes) disk store, which up to thirty different micros can all share.

The system can be expanded by adding other controllers. Details on 01-377 9341.

Oric makes friends

In four short weeks, Oric has suddenly stopped making enemies of shopkeepers, and is starting to make friends, because they are getting them.

Word is starting to reach us of software for the machine, which is "the only colour micro to sell under £100".

First package to reach me is a business package at £15 – a multi-purpose/personal records file which "permits the mass storage and file-handling



of confidential information."

Details from Kenema Associates on (0934) 21315.

IBM opens the door

People are saying quite unkind things about IBM and its operating system, essentially trying to suggest that IBM is gradually perverting it to stop other people running their software.

It may happen one day, but don't believe it yet – there is no sign of it, whatever IBM's rivals may say.

All the signs so far are that IBM really is keeping the Personal Computer "open" by publishing all the details of software and hardware. Possibly the most telling indication is the announcement of a "hard" disk option and a bigger "XT" version of the PC.

Inside the announcement of a £4,858 system (a minimum "self-sufficient" box with 128 Kbytes, a single 360 Kbyte floppy, a 10-megabyte hard

disk, keyboard, monochrome display and printer) is the encouraging extra announcement of a program transfer utility.

This does the very simple job of taking your programs from floppy disk and putting them on the hard disk. You may think it strange that one would comment on so obvious a necessity – wait till you try getting Visicalc on to an Apple hard disk.

The announcement holds nothing astounding, even though there is a new version of PC-DOS (IBM's version of MS-DOS) because IBM is under no price pressure (yet) in the UK.

In America, the new machine was coupled with a noticeable price cut, said the observers – probably because of the launch of Texas Instruments' Professional

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From this pic, you can't tell that the screen is in glorious Sony Trinitron colour – but you can see that it is a nice, compact size – making it easy to read the Viewdata print on it. It is a nine-inch screen (diagonal measurement).

Sony thinks the interesting thing about it is the fact that it is being used by nearly half the Prestel customers who joined last year.

In fact the interest lies in the fact that we will soon be able to buy Sony monitors for our BBC and Commodore 64 micros (and all the rest of them) which will mean that rival tubemakers will have to sharpen up their production, too.

False economy?

Admittedly, £10,000 is a lot to pay for a TV, even one that can talk back down the phone line. So it isn't all that obvious why Homelink has decided to ask people for £10,000, and supply one.

Apparently the lure is so strong, that people will rush to invest the sum in the Nottingham Building Society.

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Software giveaway

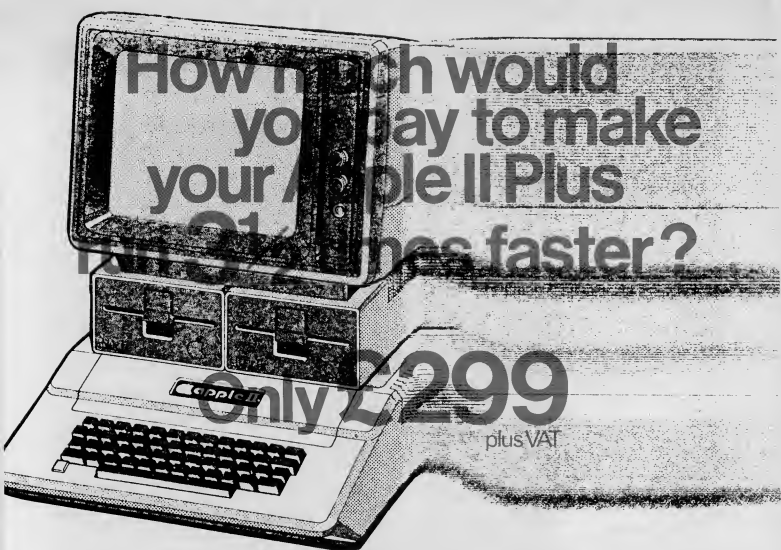
i.e software library of a Commodore user group called the Folklife Terminal Club, is being thrown open to any Commodore user.

This magnanimous gesture by the New York club means access to archives of 5,000 "public domain" programs, in the areas of education, business, games, utilities, and more than 25 other categories.

The software itself is FREE, but you have to buy the

diskettes on which it is stored. And there is a copying and mailing fee of £7 per diskette, which covers that.

Send your £7 to Folklife Club, Box 2222, Mt Vernon NY 10551, USA, and the first diskette you order is the Catalog Disk. That has an automatic disk cataloguing program, a listing of available software, and complete instructions.



SAVES TIME

Imagine the time, energy, and frustration you could save by boosting your Apple's speed from 1 Mhz to 3.58 Mhz. That's 3½ times faster than normal, making the Apple II Plus arguably the fastest Micro on the market.

How is it possible? It's all down to ACCELERATOR II. This new plug-in board from Pete & Pam Computers contains a 6502C Processor and 64K of memory. The board runs all native Apple II software, including programs written in Applesoft, Integer, Machine Code, Pascal, Apple Fortran 77 and Forth.

Amongst the many thousands who could benefit from ACCELERATOR II are users of Visicalc, DB Master, Micro Modeller, Multiplan Tabs, and Systematics.

SUPER FAST

In November 1982, PCW published a bumper round up of all the Benchmark Timings since PCW began. The Olivetti M20 came out top of the 'league' with an average Benchmark timing of 11.5. Running the same Benchmark test programs,

the Apple II Plus with Accelerator II averages a timing of 8.58 — that's an incredible 25% faster than the Olivetti M20.

We have reproduced some of PCW's findings, incorporating Benchmark Timings for the Apple II Plus with Accelerator II.

Machine	BM1	BM2	BM3	BM4	BM5	BM6	BM7	BM8	Average
Apple II Plus with Accelerator II	0.3	2.4	4.5	5.0	5.5	8.2	12.9	2.98	8.6
Olivetti M20	1.3	4.0	8.1	8.5	9.6	17.4	26.7	1.6	11.5
IBM Personal Computer	1.5	5.2	12.1	12.6	13.6	23.5	37.4	3.5	17.6
Osborne 01	1.4	4.4	11.7	11.6	12.3	21.9	34.9	6.1	19.9
Intertec Superbrain	1.6	5.2	14.0	13.9	14.8	26.3	43.2	5.6	21.9
Apple III	1.7	7.2	13.5	14.5	16.0	27.0	42.5	7.5	24.7
ACT Sirius 1	2.0	7.4	17.0	17.5	19.8	35.4	55.9	4.3	24.8
Xerox 820	1.7	5.5	15.5	15.1	16.2	28.9	46.1	8.0	26.1
Apple II	1.3	8.5	16.0	17.8	19.1	28.6	44.8	10.7	30.4
Commodore CBM 8032	1.7	10.0	18.4	20.3	21.9	32.4	51.0	11.9	34.3

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featured an interview with Bill Gates, head of Microsoft. Microsoft wrote both PC-DOS and MS-DOS, and Gates was explaining the similarities.

According to the man at Compaq, the differences revealed by Gates were enormous. According to the man who interviewed Gates, he said nothing that could possibly be interpreted that way. According to other imitators, depending on their success in implementing their own versions of MS-DOS, or depending on the point they are trying to make, both points of view are correct.

What it boils down to is this. There are people who have produced machines which are sufficiently similar to the IBM that they can be sold on that similarity.

Some of those people have also "improved" both on the IBM hardware and on the MS-DOS software. Then, to show how clever they are, they have announced both total compatibility, and the improvement.

Then they load IBM approved software, and find that only 80% of it will run. Surprise, surprise. But guess whose fault it is!

Exhibitors get choosy

There is only one Comdex, and that is the exhibition in Las Vegas in the late autumn.

There is another in April (26-29) which up till this year had been growing just as fast, and was just as worth attending if you had to know what was new.

This year, it has "only" 600 exhibitors in Atlanta, Georgia.

It sounds enormous, but the Spring show in every previous year has been bigger than the preceding Fall show. Last Fall, Comdex had around 1,000

Flexible character

The first reaction on seeing the £1,500 Optim Amigo or the C/WP Context, whichever name you want to give it, is to wonder where the computer is. Next you puzzle over where a second disk would go.

In fact, the computer and the second disk are here in front of you — and there is not only one computer there to see, but two, because the thing that sets this C/P/M system apart from the rest is the fact that it uses a processor to drive its display, and another to run your programs.

"The unconventional thing about the Context is the incorporation of the Rockwell 6502 microcomputer (that is an ordinary 6502 chip) which enables the user to treat text like graphics on its 192000-element display screen.

This isn't quite as unusual as it sounds.

Most computers costing more than £200 — and one or two under that price — have at least a "character generator" chip — a processor which scans the main memory of the computer and turns some of it into the matrix of tiny dots that look like writing on a video-screen.

However, most character generators are merely fast, and not at all versatile. They can only display the letters stored, permanently, in them — not lines and filled areas. A processor, often slower in generating characters, has nonetheless got the extra flexibility to draw lines and shapes.

Hence the Context (or

Amigo) and its unusual graphics ability for a C/P/M machine, can be made to perform quite clever tricks.

Sold by C/WP, the system includes a special version of Wordstar which takes account of some of these abilities, for no extra cost. Details on 01-630 7444.

It almost seems a shame to tuck this away — but a new sort of "character generator" has been announced as a chip, by Intel, the original microcomputer builder.

Intel has designed this to do a great deal more than display characters on a screen. First, it works fast, so that there is absolutely no need to sit in front of a terminal watching new lines gradually flicker into existence. Software designers, of course, will put their own convenience in front of ours as before — that means, pretend they are waiting for paper to move past a print-head — but there is no actual need to do so.

But more significantly, this chip is built with an awareness of the fact that most characters need not also be displayed, but only, edited.

So it is a "co-processor" to the Intel families of processor chips, and takes all the more time-consuming tasks of text editing and display away from them.

Examples of the commands most processor chips obey would be: add registers, move memory, compare memory, perform "logic" or arithmetic, store data, and so on. This chip gets commands such as Skip, Repeat, Tab, Superscript/ Subscript, Smooth scroll, Start/ Stop — things you will recognise from the best word processors, and some that you don't normally get, even on those.

It is numbered the 82730, and you need not expect to see it inside any computer you may buy in the shops for at least a year.



exhibitors, so Interface Group will have to do a bit of drum-thumping. Either that, or cut exhibition prices. Nobody can afford all these exhibitions

each year, and obviously the picking and choosing has started.

Baby Oric

The first appearance of the 16k Oric-1 is now scheduled for late May/early June this year.

The original plan was for both 16k and 48k models to go on sale at the same time, and advertisements for mail order models went into the computer press at the end of last year. Since then Oric has had its fair share of problems:

demand for the 48k version was higher than expected — a ratio of 80:20 in favour of the bigger machine — and the 16k model ran into technical difficulties.

"The 16k unit is exactly the same design as the 48k one," says Oric's managing director Barry Muncaster. "We would have had no problems if the specification of a particular chip had not altered just prior to manufacture. However, it did — resulting in us having completely to change the 16k PCB, which from start-up to production has taken 12 weeks. The 16k has had to be

VisiCalc rival gears up

Micromodeller, another "improved Visicalc" has apparently been sold to over 5,000 people in this country. It is now available on the new 16-bit machines, the ACT Sirius, the DEC Rainbow, and the IBM and Hitachi micros.

The company which sells the

program in its 16-bit version is ACT Pulsar, so it should be available on the Sirius from Sirius dealers very quickly.

Anybody with another 16-bit MO-DOS type computer should contact Barry Jacques at Pulsar, on 021-454 8585.



See 'Easy interface'

viewed from the manufacturing point of view as a totally different product. Naturally, this had caused a delay.

Oric's policy has been to send 48k models to all 16k mail order customers, with a note to say that the machine is on extended loan and can be replaced when the 16k unit is available, or kept — subject to payment of the price difference. The company now claims to have cleared its mail order backlog, and in fact will no longer accept orders by post. The 48k version is now to be found in many High Street shops, and discussions are under way with all the major chains the consider pricing and dealer margins on the 16k model.

Steve Mann

Easy interface

Following the success of the stylish Competition-Pro joystick for the ZX Spectrum, Kempston (Micro) Electronics has announced that the joystick will now be made available for the VIC-20 and Atari 400/800. The Spectrum version is now on sale over the counter at many branches of W H Smith, and numerous software houses are developing arcade games for use with it. Competition-Pro for the Spectrum (which includes interface) is £25, and models for the VIC and Atari will set you back £16.50.

Kempston has also announced a new Centronics interface to connect the Spectrum to a whole host of popular printers. The interface will recognise LLIST and LPRINT commands, and there is also provision for special characters — condensed, expanded, etc. Supplied cased and ready to use, the interface simply plugs into any Centronics-type printer, and also includes driving software to allow up to 128 characters

per line.

This is especially good news for Spectrum owners who would like to use their computer for business applications, as Hilderbay Ltd has produced a range of business

Commodore has announced that it will build a factory in Corby, where VIC-20s and Commodore 64s will be built. Great news: so why are all the dealers sounding so close to panic as they cheer?

The answer may lie in the Silicon Office. The appearance of a version of the Silicon Office on the ACT Sirius is a warning which many will interpret with as much alarm as a sailor would on seeing rats running down the anchor cable.

The Silicon Office is a program which combines several functions which, normally, you have to buy three or more separate programs to do. Even at £900 for the program, and considering also the limitation that it would only run on the Commodore 8096, there are a lot of them about.

On the face of it, there is nothing too surprising about the move.

There are now well over 10,000 Sirius machines in Britain, nowhere near the number of different Commodore machines (over 80,000) but more than the number of 8096s. So it is a logical move for a program that needs a lot of memory to operate in.

Also, the 8088 processor chip inside the Sirius and the MS-DOS operating system that drives it, can be found with little variation on the Digital Equipment Rainbow, the IBM PC, and several hundred other imitations of

software to be used in conjunction with Centronics-type printers.

The interface is supplied complete with connecting lead and a 12 month guarantee. Price is £45 inc VAT (but add £1 p&p). Kempston is at 180a Bedford Road, Kempston, Bedford MK42 8BL.

Steve Mann

Fruity Forth?

Forth (a language) is available on the Commodore 8000, for £180, from Kobra Micro

Marketing.

That isn't the cheapest Forth in the world, so I'm going to reproduce some of Kobra's claims for it, in the hope that it will impress people who know more about Forth than I do.

"It is," they say "a standard Forth Interest Group Forth (fig-Forth) with many extensions, including double-precision arithmetic, random numbers, IEEE control words, trigonometric functions, and a powerful string package with string-searching capabilities."

It may seem pathetic to leave it there, but either that impresses you, or it doesn't. And there's no earthly way of

those.

The company that makes the program, Bristol Software Factory, is careful not to imply any criticism of Commodore in making the announcement of its MS-DOS version.

But nothing can hide all the anxiety that Commodore dealers exude, following the launch of the 500 and 700 models in February.

For a start, Commodore barely managed to get the machines to the shows — many dealers were obliged to show cardboard cut-outs of the new models.

And at that, they could count themselves lucky, because at least they didn't have to explain why there were so many non-functional ones, nor why the integral disks were not there.

One analysis of what is happening is that the whole corporation is drunk on VICs.

Last year, Jack Tramiel (the extraordinary character who owns Commodore) actually forecast the end of the VIC, and its early replacement by the 64, before Christmas. He derided the VIC as a "games machine" and told me: "I'm very glad we had the strength to resist the games market while Apple and Atari were getting into Space Invaders — we have developed a firm background in business software, which is where the market lies."

Then he discovered that the company was about to sell its millionth VIC, and instantly sent out the cancellation

orders. All production capacity was to be put to producing home computers. Forget the business machines.

Unfortunately, the shopkeepers can't forget them. They have to have business machines to sell. They can't sell the new Commodore 500 and 700, and are having to make do with 8040s and 8096s in new boxes.

I asked a friend inside Slough what on earth was going on. He said: "Don't ask me. I'm just keeping my head down, and hoping nobody notices."

This paper had hoped to get a 700-series machine to review for this month's Benchtest. Commodore couldn't oblige, so we contacted dealers, including one who had displayed five of the things at the big Commodore exhibitions.

They had sent them all back, because they didn't work.

Commodore won't believe this, but when they first announced the damned things, back in April last year, I felt like a positive traitor as I wrote what I didn't believe. I believed that there really would be one or two machines, with 8088 chips as second "add-on processors," with Concurrent CP/M-86, just as promised, in September.

But natural caution triumphed, and I wrote that promises of "available in September" were optimistic.

Perhaps we should have asked: "Which September?"

Personal add-ons

The news that Apple will be selling Digital Memory Oscilloscopes (made by Northwest Instrument Systems) in Europe has been intriguingly disguised by Northwest's press announcement.

This told of an "agreement by which Apple will distribute the new line of Apple-compatible personal

instruments". The imagination absolutely boggled! But it turned out that the Northwest range was in engineering and manufacturing and test and service and education and physical science application, and that the first product was the memoryscope. It can be linked to an Apple, and the resulting system costs around \$5,000.

starting any explanation of why it should (or shouldn't) if it means nothing to you. Get the book.

Manhunt

Herewith the final episode in the ongoing saga of the PCW Manhunt Competition, first seen in our September 1982 issue. So overwhelming was the response to our three part puzzle that many readers who managed to ring in with the correct answer and find Brigadier Bumper Harris were disappointed in not being the first with the solution.

Well, PCW in its magnanimity decided to do something by way of compensation . . . wait for it, we ran another competition. I'm afraid we had to slightly reduce the prize money second time round, to £200, but now we are pleased to announce another winner. Congratulations go to Mr G J Blackledge of Lancashire.

Doubtless readers will be interested to know what the second puzzle was and what Mr Blackledge managed to score in the given time res-

traints. So, purely for your own amusement, here is a brief summary of the rules.

You are asked to make up a crossword in the grid shown and incorporating the letters P, C, W, as given. All words should contain at least three letters and appear in the Concise Oxford Dictionary (not the appendices). No foreign words. Colour any squares black that are to be used as



Letter	Value
Z, Q	9
X	8
V	7
Y, K	6
F, M, W, H	5
B, C, G, P	4
D, L, T, N, R	3
A, E, I, O, U, S	2

separators. No clues are necessary. Your score is then worked out from the letter values shown.

As you will see, Mr Blackledge scored an amazing 165 points using 14 words! Well done!

Liberal Topic

An unusual opportunity to tell an unusual group of people about micros: the American journal Topic is asking for 2,500-word articles for a special edition about computers "in the liberal arts". This also includes computers in education.

"Topic's readership consists of international liberal arts-faculty people in a variety of fields," says the request, adding: "Its readers are therefore highly sophisticated, but may not be acquainted with technical jargon."

Obviously, every paper that wants articles doesn't make a habit of writing to us, and if they did, we couldn't help—but this is so unusual that it seems

worth publishing the address of Thomas W Hart, Ph.D and Joseph Levenstein, Ph.D at Washington and Jefferson College, Washington, Pennsylvania 15301.

Wet electronics

I quite liked the idea of a washing machine with a computer in it, so I bought a Philips machine with "ELECTRONIC" written on the front.

It broke down, and when the engineer opened the box up, one couldn't help noticing tyre completely traditional cogs and wheels. "Where's the electronics, then?" we asked (a bit annoyed, since it took Philips three weeks to trace the fault).

The motor, it transpires, runs at different speeds. It goes slow for wash, fast for spin. This is because there is a thyristor in the system. A thyristor is electronic. Deny that if you can.

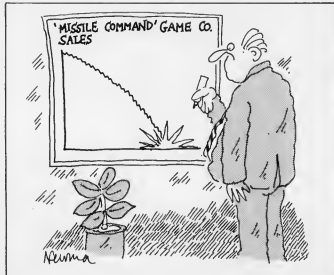


The reason the screen and keyboard on this Canon AS100 micro look so titchy is simple: those are eight-inch diameter disk drives. Next to them, in that black strip, are two one-third height five-inch drives.

I know I'm an ungrateful wretch, but when everybody is moving to offer three-inch drives, this sort of tank with concrete foundations rather puzzles me.

I also have to report that, eighteen months after Sirius brought the Intel 8088 chip to the UK, Canon has told me that this box "is one of the first to bring fast 16-bit data processing to the microcomputer class". It has an Intel 8088 with MS-DOS as the operating system.

Somebody, tell them. (And mention that the war's over, while you're at it).



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RELIABLE CODE MAKE YOUR MICRO WORK

Ric Wickham gives some pro-standard programming tips.

I am a systems programmer by profession. I have a part-share in a Video Genie which I use in my spare time to run astronomical simulations and, of course, games. My applications tend to need large volumes of fast code. In this context, 'large' means I need a shoehorn to get it into the 16k machine and 'fast' rules out the Basic interpreter. Since I only have the machine part-time I can spend a lot of time on design and coding; but when I have the machine I want to run programs, not debug them.

This has led me to a standard programming style and environment which has significantly improved the reliability of my programs, though at a slight cost in performance. The style is modular, heavily beset with conventions (mostly enforced by a macrogenerator) and compact. The ideas involved are not original, though I believe this is the first time they have been applied to micros. They come from a number of sources, notably the GIER Algol compiler of the early sixties.

Reliability

How do we ensure reliability? Firstly, by ensuring that all common programming errors are detected.

The Z80 code is very bad for this. The only hardware check is for 'overflow' which doesn't usually mean quite what I expect! Data and control stacks are muddled with no established protocol to sort them out so an extra PUSH or POP instruction can cause the next Return to transfer control to a data address; and jumping to address $\#$ (a typical result of leaving out a module in a multi-module program) resets the machine.

All the checks must be coded in so I use the macrogenerator. I have standard subscription macros which check bounds; a macro for calling a procedure in another module which checks that it's there; and standard multiply and divide procedures which check overflow. (So far, overflows on addition and subtraction haven't hurt!)

Secondly, by ensuring that all detected errors are reported adequately. Again, the Z80 code is unhelpful. State-of-the-art on large machines (and some small ones) is a stack print giving the names of all procedures entered with the current values of parameter variables but this implies a considerable set of conventions. To be able to make such a report, the error-handling routine must always be able to find out the state the machine was in when the error occurred; this implies that the control stack

must always be in a 'clean' state, even when processing an error (such as calling a missing procedure) which occurs halfway through updating the control stack.

Then, never lose control. In this context, 'losing control' is when the machine jumps to a random address. The best run-time system in the world is useless unless you are actually obeying it! Related to this is another point: if your program loops it should be possible to regain control without resetting the machine (if possible, without losing the state of the control stack).

What can we trade?

Nothing's free. I can do without some performance — although Basic is too slow, I don't need the ultimate in machine-code performance. I don't mind having to run all my programs through a macrogenerator before I assemble them. In fact, I welcome it since I can unload a lot of book-keeping onto the machine. Again I really don't care if no-one else can use my routines (or even read my files!). I have a fairly large set of routines in my run-time system, about 2½k. I find this no disadvantage: for small programs I don't mind using the space and my large applications are so similar that I need most of the package anyway.

Consider the fragments

Any program is built up of short sequences of instructions to perform simple operations — for instance loading a variable, adding a constant, calling a procedure, loading a formal parameter (within a routine), identifying an actual parameter (before calling a routine), and so on.

In fact, the operations I've just listed are among the most common fragments and their implementation matters more to a coding standard than anything else. Get these right and your machine will love you; get them wrong and your programs will always be bulky and/or slow and/or just plain unfriendly!

Consider loading a value. If the value is in a fixed place say at 'addr', the load only needs one instruction, eg,
LD HL,(ADDR)
whereas if the value is on the stack, 'addr' bytes above the stack pointer (as is typical for programs with recursive procedures or

dynamic space allocation) you need
LD IX,SP
LD L,(IX+ADDR)
LD H,(IX+ADDR+1)

which is not just more instructions; the instructions themselves are longer. Moral: don't keep things on stacks!

In fact, the Z80 code is very heavily biased towards fixed places for things. Given this, it makes sense to pass parameters to procedures by address: the addresses of things are constant and so can be permanently assembled into the program, so that the caller of the routine doesn't need to have any code to pass a parameter. This reduces the size of a call at the expense of a slight increase in the code required to access the parameter from inside the procedure. This must be the right way round since there's usually more than one call per procedure: so we optimise the calls.

The solution

Having covered the background, the solution is fairly straightforward.

1. All variables are statically allocated. Addresses are therefore fixed by the assembler. (Actually, they're fixed by my loader but that's a different story!)
2. All procedure calls are indirect. Calls to procedures in the run-time system, for instance the multiply routine, are all made by a CALL to fixed addresses containing jump instructions; I can therefore replace bits of the system, or move them around, without needing to change any programs that use it. Calls to 'user' procedures, that is, those in other modules of the same program, specify a 'procedure number' to a call on the Base. There is a vector of indirect addresses indexed by procedure number; this vector is used by an indirect-call procedure in the Base to find the procedure the application is actually trying to call. The vector is called GVEC and is in a fixed place, so application modules can have GVEC initialisations compiled in.
3. Parameters are passed to Base procedures in registers in a more or less ad-hoc fashion. All these procedures are wrapped in macros which remember which registers to put things in, and the values of the indirect addresses.
4. Parameters are passed to application procedures by address. Since these addresses are constant, an appropriate number of pointers are assembled in-line in the code following the call. The procedure using the

5. Since, from the point of view of the called routine, the parameter pointers are at fixed addresses, recursion is not possible. The procedure header therefore contains an 'entered' flag which is inspected by Base during the call to prevent recursive calls.

6. In order to keep the control stack 'clean', there must be no temporary variables on it while a call is in progress. This limits the scope of temporary variables to a single expression, which I regard as a good thing, since experience suggests that I can't remember what I've got on stack much past a dozen instructions!

It's worth noting, in passing, that this sequence occupies five bytes; the standard way of printing a string on the Genie is

```
LD HL,MSG
CALL 28A7H
```

PRINTX	EQU *	; Declare a local label as 'here'.
	ORG GVEC+PRINT+PRINT	; put the address of this routine into
	ADDR PRINTX	; the indirect call vector.
	ORG PRINTX	; and continue to generate the routine
	DEFB 255	; Recursion flag.
	DEFB 2	; 2 bytes of parameters.
STRING	DEFS 2	; 2 bytes space for parameter.
	DEFB 6	; length of name of routine.
	DEFM 'PRINT'	; the name itself. .
	DEFB 0	; . terminated by zero.
; The actual code for the procedure starts here; for instance		
	LD HL,(STRING)	; to load the address of the parameter..

A MATCH FOR BRUTE FORCE

Tony Harrington tells us why a chess computer company caused a scandal...

The German firm of Hegener and Glaser started out as an importer of electrical components. Its clients included firms such as Siemens, Braun and Telefunken.

All this might seem a long way from microcomputer chess, but as their company prospered, Manfred Hegener and his partner began looking around for new fields to develop. And here coincidence — which so often seems to be responsible for bringing entrepreneurs into the microcomputer chess market — took a hand.

One of the projects Hegener and Glaser opted for was to produce a new telephone. As part of the contract for the telephone project, the firm acquired the services of two programmers, Thomas Nitsche and Elmar Henne, whose hobby — you guessed it — was writing chess programs on mainframe computers. At this time (around the beginning of 1980) the first successful microchess programs were on the market.

After talking to Nitsche, Hegener and Glaser decided that there was a definite demand for a well designed chess computer. They found that their enthusiasm for pioneering in this market was not shared by the banks, but their electronics business provided them with sufficient investment capital.

By Autumn 1980 they had designed and produced 3000 units of the Mephisto portable chess computer. Within a month, orders had reached 18,000 and the production facilities had to be expanded.

In January 1982, about eighteen months after the production of the first Mephisto, the firm produced an updated version of the program, called the Mephisto II. By the end of last year, the firm reckons that total sales had reached 25,000, with 6% of these units being sold in the UK, through Competence, run by Terry Knight. A full-sized, well-finished wooden sensory board and wooden pieces were then produced as an add-on to the portable set.

The details that follow were provided by German amateur chess champion Ossi Weiner who has worked as a consultant for the firm since 1981.

By profession, Weiner is an architect, but he has played in the German Bundes League, the top German chess league, for a number of years. He has an estimated ELO rating of 2300 and has been champion of Munich three times. In 1980 together with two others he wrote a book about chess computers. This started him off as a chess journalist and a number of articles in magazines and newspapers followed.

He gave up his profession to become more involved with chess programs and artificial intelligence. In the first instance, this took the form of setting up his own

chess shop specializing in selling microcomputer chess machines. By 1980 chess computers had become very popular in Germany and the shop did well.

He decided that Hegener and Glaser had a machine with a great future in the Mephisto. He started to buy more and more of Hegener and Glaser's stock, and in the end was buying a significant proportion of the whole stock.

'Hegener came to see me and said, you are so good at selling chess computers. Don't waste your time running this shop; come and join us — so I did,' he said modestly.

Since then he has been an integral part of the Hegener and Glaser team, along with the programmer Thomas Nitsche.

From Weiner I learned that work is now well advanced on the Mephisto III, a machine which the firm hopes will break the ELO 2000 rating barrier.

According to Weiner, the Mephisto III program will continue on the same lines as the Mephisto II. He explained that the Mephisto programs are different from the majority of other chess programs on the market, in being more selective. They don't specialise in brute force calculations.

Brute force in chess programming has a very specific meaning. It means that the program looks at every possible move, no matter how idiotic or unlikely. The Mephisto program aims for a pre-selective, intelligent search, and in-depth analysis. For example, at tournament level, the Mephisto II does a four/four balanced search. In other words, it makes four brute force moves, followed by four selective moves, in its search sequence. We are talking here about an eight ply searching sequence, or four full moves for white and black.

If there are checks or forced captures involved, of course, the selective search can go deeper, even on the Mephisto II.

According to Weiner, the Mephisto II has won a number of games by playing strategically better than other chess computers, though the other side of this coin is that it has also lost tactical games to machines whose concentration on brute force paid a better tactical dividend in positions with tactical complexities.

With the Mephisto III, the brute force component of the search will be reduced to the initial two ply. From there the selective mechanism will take over up to a depth of thirteen moves on the lines.

'This posed us a problem,' Weiner said. 'How does the machine decide which is a main line?' This, he pointed out, is the creative part about designing and writing a chess program, that is, sorting out how the chess program will find out where to search

and where not to search.

The solution, Weiner said, was to have the machine distinguish between 'quiet' and 'wild' positions, and to approach the two types of position differently. Quiet positions are those where there are no immediate tactical possibilities. Wild positions, as the name suggests, are positions where a lot is going on, where pieces can be captured and attacked or checks given.

Traditionally, computers play quiet positions very badly. Machines which specialise in brute force calculation of tactical positions find themselves with no obvious move to make. What happens, as a glance at computer games listings will show, is that the machines act aimlessly. They shuffle rooks from square to square or march their castled kings from side to side. The result is like suspended animation until some human operator puts them out of their misery, or they exhaust the fifty move rule.

'What has to happen here', Weiner said, 'is that the computer attack has to have a way of recognising that this is a special type of position. It is a time not for tactics but for planning ahead. It has to devise a strategy for the game'.

Writing the algorithm which will give the machine such a capability is no easy matter. According to Weiner, the algorithm has to specify such matters as how to evaluate the relative strengths of king and queen side flanking movements, pawn structures and so forth. The result, in the Mephisto's and Roman III's case is that it now plays a very 'intuitive' game.

'The nice thing about it is that it can surprise you with its moves. Normally, if you understand chess computers you can lay money on the moves they will make and win every time. But this machine surprises even Thomas Nitsche,' he said.

The other side of the coin is that in playing more intuitively the machine has become more 'humanlike'. It will play brilliantly one day and have a totally wrong intuition the next day.

On the lower levels, there is no real improvement — perhaps even a slight weakening — by contrast with the Mephisto II and Roman II. But on the higher levels, particularly tournament level, where 19 ply searches are possible, it will play a much stronger game, Weiner says.

At the moment the programme is running on a large computer and has not yet been translated into microprocessor assembler code. It has taken and is taking a long time to debug, mainly because of this intuitive approach. But Weiner hopes that it will be ready for the German micro-computer tournament in Hamburg in August.



Mephisto with full-sized board

In addition to its success with the Mephisto, Hegener and Glaser scored a notable victory recently in the matter of the TV World Cup put on jointly by the BBC and German television.

Those of our readers who watched that tournament, screened every Sunday on BBC2, would have seen the Mephisto legend flash up in red on the screen from time to time. A rather complicated tale lies behind this. For while it passed relatively unnoticed in the UK, in Germany that Mephisto sign popping up on the TV screens caused more than just raised eyebrows.

Der Spiegel, the German equivalent of *Time* magazine, devoted a full page to telling its readers what an outrage this was. Advertising is unheard of on German TV. Yet here in the most blatant form was the Mephisto legend advertising, albeit indirectly, a product from Hegener and Glaser.

It came about like this. Helmut Phlegner, the German grand master, belongs to the same chess club as Ossi Weiner. Phlegner was to do the commentary for the World Cup for German television. He told Weiner that the current system for moving the pieces on to the display board was unsatisfactory and far too complicated.

It took a lot of time, and needed two cameras. This made it really expensive as well as difficult. Phlegner mentioned to Weiner that Scisys had been trying to produce a system to solve this problem but that it hadn't succeeded yet.

Weiner told Hegener and Glaser about the problem and they were interested. BBC representatives came to Munich and met Hegener and Glaser to discuss a possible development. 'We told them it was an expensive business developing a project like this,' Weiner said. 'The TV people said that they didn't mind, it costs thousands of pounds to film in any case. Go ahead and develop it,' they told us.

'We intended to develop such a system in any case. And with considerable work and effort we did come up with one.' The finished system does away with the need for cameras and with long hours of studio rehearsals, since Hegener and Glaser had the logical idea of using the chess board as if it were a terminal to input information directly to the TV screen.

The TV screen displaying a chess board and simply by moving a real piece on the

real demonstration board it makes the same piece move on the television screen. Additional controls were built into the system to enable the demonstrator to highlight any square that he chose.

It was obvious that the system would save masses of TV time since no camera crews were needed at the demonstration session. But the system itself was not cheap to build. It was necessary to use a computer to interface with the display board and considerable processing power and storage was needed to drive the extremely high resolution graphics display.

(According to Weiner the interface system designed by Hegener and Glaser tells each of the million dots on the TV screen which colour to take on, at any particular moment.)

When the system was complete Hegener and Glaser took it to the TV people and here is where the problems began. They had taken it upon themselves to design a system without signing a contract. This might sound daft, but it was strictly a practical decision. As Weiner pointed out, nobody they spoke to had the authority to give them the go-ahead. 'Everyone we spoke to at the BBC or at German television thought that it was a wonderful idea but none of them could authorise money to fund the development.'

In the end the development work took four months and cost Hegener and Glaser between one hundred thousand and two hundred thousand Deutschmarks. During all this time they hadn't seen a penny on their investments. 'We weren't looking for a fortune, but we wanted some contract that would give us at least our demonstration costs back,' Weiner said.

The television people said that it was impossible, and suggested that they should be allowed to use the device during the broadcasting of the tournament, on spec as it were. 'They told us, if it's good, then we'll pay you,' Weiner said.

Obviously, that wasn't a particularly satisfying arrangement. In the end, being practical men and women, an amicable arrangement was worked out. It was agreed that Hegener and Glaser should be paid 25,000 Deutschmarks and to compensate them for their development costs the Mephisto sign would be flashed up on the screen now and then.

This somewhat unorthodox agreement

satisfied both the TV people and Hegener and Glaser, who were alive to the publicity value of having their name broadcast to a selected interested audience, who, by the simple act of watching the chess coverage on TV, had declared themselves potential buyers of microcomputer chess sets.

None of this was to the liking of *Der Spiegel* which felt that some underhand activity must have taken place and which devoted one full page to telling its readers what a scandal this was. Weiner was most aggrieved when he mentioned this, 'Der Spiegel made a great thing out of it. All the facts were open to the public to know from the start. We answered all their questions, fully and frankly and the net result was written up as though it was brilliant investigative journalism.' But Weiner reckoned that even the publicity provided by *Der Spiegel's* write-up did Hegener and Glaser a reasonable amount of good. 'People said Hegener and Glaser must be pretty smart if they can beat the advertising rules like this,' he said.

Just how smart they are, we will be able to judge for ourselves when Mephisto III comes onto the market later this year.

Games section

White: Mephisto II; Black: Fidelity Elite Sicilian Defence: Notes by David Levy

- | | | |
|---|--------|---------|
| 1 | e2-e4 | c7-c5 |
| 2 | Nb1-c3 | Nb8-c6 |
| 3 | f2-f4 | e7-e6 |
| 4 | Ng1-f3 | Ng8-f6? |

(More usual is 4...g7-g6, or 4...Ng8-e7 followed by ...d7-d5.)

- | | | |
|---|--------|--------|
| 5 | e4-e5 | Nf6-d5 |
| 6 | Nc3-e2 | e6xd5 |
| 7 | Bf1-e2 | c5-c4? |

(More to the point would be 7...d7-d6, to undouble the d-pawns.)

- | | |
|---|--------|
| 8 | d2-d3? |
|---|--------|

(Better 8 0-0.)

- | | | |
|----|--------|--------|
| 8 | ... | c4xd3 |
| 9 | Be2xd3 | Bf8-c5 |
| 10 | Bd3-e2 | Nc6-e7 |
| 11 | c2-c4? | |

(White is already embarrassed by the fact that it cannot castle K-side, because of the black bishop on c5, and now compounds this by voluntarily undoubling Black's pawns.)

- | | | |
|----|--------|--------|
| 11 | ... | d5xc4 |
| 12 | Be2xc4 | Qd8-b6 |

GOTO page 131



For travellers...

PCW welcomes correspondence from its readers but we must warn that it tends to be one way! Please be as brief as possible and add 'not for publication' if your letter is to be kept private. Please note that we are unable to give advice about the purchase of computers or other hardware/software — these questions must be addressed to Len Warner (see 'Computer Answers' page). Address letters to: 'Communications,' Personal Computer World, 62 Oxford Street, London W1A 2HG.

'Annoyed'

Having just read the March 83 edition of *PCW*, I am extremely annoyed. I am a regular reader of your magazine and have been ever since I bought my first computer in 1979. Until now you have been relatively unbiased toward any particular machine, or any aspect of microcomputing.

Personally I think that the whole aspect of micros was much better before the big name electronics firms jumped on the bandwagon. All too often these companies only promote obscure standards for their own financial gain. I realise that they are in business only to make money but a lot of good ideas from smaller firms get swept aside simply because they don't have the big name or the big money. You obviously go some way to support this theory, at least that's the way I interpreted the article entitled 'Mug Trapping' on page 104. So why do you have to mention IBM no fewer than 52 times in the 7-page 'Newsprint' article and then again seven times on one page of 'Banks Statement'?

I don't buy the magazines that deal only with the ZX81 simply because I don't use a ZX81, similarly I do not intend to buy a magazine that compares every other product with IBM. It has been stated many times that micro-computing bears little resemblance to mainframe computing, so just because one firm becomes the top dog in mainframes it should not be assumed that they are going to achieve the same results with micros. I for one hope that they don't as this could well lead to stagnation in the micro field.

If I want a glossy book all about IBM then I daresay they would supply me with one, probably free of charge. I certainly would not be prepared to pay 85 pence for it

under the guise of a *PCW* cover.

Ramon Milton, Folkestone, Kent

*Taking your points in order, we will always be totally unbiased towards any machine/machine. I can't see how anyone can describe CP/M-86 or MS-DOS as 'obscure standards'. Like it or not, Milton, small companies producing hand-crafted micros have no future in this business. It's our job to report what's happening in the industry and the European launch of the IBM is an important event, hence the coverage not only in *PCW* but in all other micro magazines and most serious national newspapers — Ed.*

Tandy brush-off

May I be permitted through the columns of your magazine to make a comment about the treatment afforded to me by 'Tandy Corporation (UK)'?

My son has a TRS-80 Model 1 and he found that the cassette relay situated within the CPU became faulty so he duly desoldered the offending said part and we presented ourselves, with part, at a Tandy shop (not in Edinburgh) with the intention of purchasing a replacement part. We were advised that although the relay was held in stock it was not possible to sell it to us; but if we left the CPU the shop would be very happy to install the new part. We were also advised that because we had had the audacity to open up our computer (NB. Guarantee period well expired) not only would we have to pay for the part plus labour for the work, we would also be charged a sum of £5 as a penalty for opening up the CPU. We were told exactly the same story at another branch of Tandy ie, it is company

policy to make such a surcharge.

Not being able to accept that a customer should be given what would appear to be a 'brush off' I wrote to Tandy with the above story with a request as to why I could not be sold the part when we were perfectly capable of installing it. I did not even receive the courtesy of an acknowledgement. I waited a few months and wrote again, with a summary of the above, asking for a full reply to my earlier letter. I duly received a reply from the Computer Sales Controller informing me that he had no trace of my earlier letter but would I complete 'the enclosed form of indemnity' and return it along with my cheque for the part plus post, it would be sent to me. I replied immediately, by Registered Delivery, to the effect that that was all very well; but he had still not replied to my letter. To date, no reply has been received.

I would welcome comments as to whether this is the recognised treatment given to customers by Tandy?

**Hugh J Leckie
Edinburgh**

DIY

I have a ZX81, and perhaps the adaptation I have made will be of interest to other ZX owners.

One of the ZX's faults is the lack of an 'on-off' switch, so I decided to fit one. The keyboard would also be better if the slope-angle was a little more acute. With this in mind I decided to combine a solution to both problems.

After a little thought the answer was simple, cheap, and, above all, successful. I bought a paint roller tray from a local DIY store for 70p and a switch from a car accessory shop for 60p. I cut off the support legs on the base of the paint-tray, which left a flat surface and a sloping one on the base. From the flat surface

I cut a section out for the 'power-pack' to fit into. The switch I fitted in the side of the tray. A small hole next to the switch, and another at the back, enables the power cable to enter and exit.

With the paint-tray upside-down there is now a flat, back area, with the 'power-pack' inserted and a sloping front area, with the computer on it.

All that remains is the wiring up of the switch. To this end I used a terminal-block connector, the cheap plastic type, again from a DIY shop, at a cost of only a few pence. Although this is by no means necessary it does enable easy disconnection and re-connection outside the new stand, should that ever be required.

I have used this adaptation for some time now and it is a great help with typing in a program, and it saves a lot of wear on the 'jack-plug' power point too.

It was a very simple operation to make the stand (simpler than trying to describe the process), and the result looks good too, as the tray was made of black plastic, and so matches the ZX and the whole thing cost less than £2! It also makes no difference if a 16k pack is fitted too.

**I P Finnerty
Great Sankey, Warrington**

'Twisted'

I am disappointed in you and your magazine. Before reading your March issue I was under the obviously mistaken impression that your magazine was neutral and unbiased. I am referring to your disgraceful treatment of the IBM Personal Computer. I have never read such twisted facts. I know that, like others, you suffer from the misconception that IBM is some big, bad corporation picking on poor, innocent, unsuspecting companies, but it may interest you to know that the PC is now outselling the DEC Rainbow

in the USA.

I also not that you dwell considerably on the few disadvantages of the system, whereas you totally ignore the many superb features of the system, like the superb quality display, the high resolution graphics, the 40k ROM, the fast processing speed, the maximum memory of over 500k, the keyboard which is a joy to use, and all the backing of the best computer company in the world. I believe that the views stated by Guy Kewney only show a total ignorance of the computer world. He is the 'mug' not the people who buy hardware and software from IBM.

P J Logan, Solihull, West Midlands

Come off it Logan, there are several 16-bit machines around with higher disk capacity, high resolution graphics and nicer keyboards selling at lower prices than the PC — Ed

Standard micros?

I wholeheartedly agree with Guy Kewney's suggestion that a potential microcomputer purchaser buys what is in the shops on the day he has the money. I am surprised therefore that PCW pays so much attention to yet-to-be-released 16 bit microcomputers and ignores so many microcomputers that can be bought off the shelf. Those microcomputers ignored include the Digital Equipment Corporation PDP-11 range of microcomputers and the Data General Microvna and Micro-eclipse ranges of microcomputers. I suspect that PCW does not regard these computers as microcomputers because they were available first in minicomputer versions. However, when I look at a 40 pin Z80 CPU and a 40 pin PDP-11/23 CPU I can't see much difference.

I am a strong believer in CP/M 80 because of the wealth of software available under it. I am a strong believer in the PDP-11 operating systems RSX-11 and RT-11 for exactly the same reason. Is so much software available for any other family of 16 bit microprocessors?

So far as not-yet-available microprocessors are concerned the ones that interest me are Digital's 16/32 bit microprocessor, the J11, and National Cash Register's 32 bit microprocessor. Both are about as powerful as the Motorola 68000 and the National Semiconductor 16032 but have a great deal more software available for them. The NCR microprocessor is particularly interesting because it offers both the NCR and IBM 370 mainframe instruction sets.

Perhaps someday IBM's menu driven Small Systems Executive for the 370 will be as popular for desk top micros as CP/M 80.

Paul Mayoh, Loughborough, Leics

Big Beeb disks?

I have just received a letter from Acorn Computers Ltd, stating 'We regret that we will not be producing software to support 8in disk drives'. This is the first indication I have heard of such a decision, and is not in accordance with the published specifications for the BBC micro. Contrary to what Acorn says, the specifications do not warn against 'being subject to change'.

I have therefore written a letter to Acorn requesting a public statement answering some questions, including: When was this decision not to support 8in disk drives taken?

As this is not in accordance with the published agreement between the BBC and Acorn Computers Ltd, has the BBC OKed it?

Why has not the public been made aware of this, and what can be done to change this decision, to the benefit of all those who want to use the BBC micro for serious applications?

I have also pointed out the problem of obtaining software in a BBC-compatible format on 5¼in disks when the BBC micro is used with the Z80 second processor, with a CP/M-compatible operating system. I have also asked if Acorn will make available a service that transfers software running under CP/M and is supplied on 8in disks in a universally accepted format to

5¼in disks in a format suitable for the BBC micro and the Z80 box.

As I know this will be of interest to many users (and especially would-be-users) of the BBC micro, I would like Acorn Computers Ltd to answer through this column, to the benefit of all readers of PCW.

M Christiansen, Trondheim, Norway

Well, how about it, Acorn? — Ed

Bad bugs bite back

Bug-Byte has a two-page advertisement in your March issue extolling the marvels of its games software. They may be as good as Bug-Byte describes them, but after nearly a year of trying to get one that worked, I gave up trying to find out.

I ordered 'Space Warp' in April 1982. This was the first game I had bought, so that when it did not work I thought it must be my recorder. I tried three recorders and it still did not load. I returned it, and after about two months Bug-Byte sent me a replacement. This did not load either. I returned it and waited for my money to be returned. I waited five months. In that time I wrote to Bug-Byte twice, including once to its Managing Director, without any acknowledgment from them. Finally, in January I received another copy of 'Space Warp', despite having asked for my money back. This copy did not work either!

After indicating that I would take stronger action if my money were not returned, I received a cheque from them without any covering letter or note for their really appalling service.

B Kemp, Kingswinford, W Midlands

Plagiarism

TJ's Workshop column in February '83 contained a useful contribution from Anthony Newgosh called 'Poking the MZ-80K'. Recent publications also contained similar hints. What these 'contributors' failed to reveal was the source of their

information constituted a major part of a recent paperback publication from Sigma Technical Press called *Sharp Software Techniques* by DH Trowsdale and M Turner.

Surely this is a serious copyright infringement, which is rather a grey area in computing circles. What little information I have obtained points to major loopholes in legal obligations towards software protection. Copyright laws are almost identical in Ireland to UK legislation but I am surprised nothing has been done in this area.

A simple example might prove this point. Take a popular game, say Mastermind. This program could be sold by any person without copyright infringement by simply changing one of the variable names. Is this an example of deficiencies in current legislation?

There are other areas which are cause for serious concern, namely, individuals' right of access to personal information held on numerous government departmental computers and the right to have misleading or incorrect information amended.

There may be the foundation of a series of articles on this grey area for future publications which ultimately could lead to constructive legislation.

As I do not have a legal background, these are personal reflections on this area. I also wish to point out that I have no connection whatsoever with the aforementioned publisher.

Brian Hurley, Limerick, Eire

It is equally likely that the TJ contributors discovered the POKEs for themselves by sitting down and experimenting. Perhaps authors of the above-mentioned book collected their ideas from TJ's Workshop? — Ed

Offbeat functions

John Evans' method for providing in the inverse trig functions lacking in most dialects of Basic (*Communications*, April), struck me as being far too slow for any serious application (least of all tracking satellites!). Simple application of Pythagoras' theorem quickly provides formulae for arc cos and arc

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sine, and the slightly more esoteric functions of arc secant and arc cosecant are all derived from the arc tan function provided on virtually every version of Basic. These can easily be incorporated into a program using the following function definitions:

```
DEF FNACOS(X) =
  ATN(SQR(1/X2-1))
DEF FNASIN(X) =
  ATN(X/SQR(1-X2))
DEF FNASEC(X) =
  ATN(SQR(X2-1))
DEF FNACOSSEC(X) =
  ATN(1/SQR(X2-1))
```

These function definitions are only valid for valid values of X, ie:

Arccos: $0 < X \leq 1$

Arccsin: $0 < X < 1$

Arccsec: $X \geq 1$

Arccosec: $X > 1$

Note that any argument that would give an angle of $\pi/2$ gives a divide by zero error, and these cases should be checked for.

Nick Osborne
Sutton Coalfield

BBC timings

Listed are the results of the PCW Benchmark tests conducted on a Grundy 8200 using BBC Basic (Z80) and Microsoft Basic.

	M.SOFT	BBC
BM1	1.1	.84
BM2	3.9	3.80
BM3	10.27	12.34
BM4	10.04	13.57

BM5	10.82	15.40
BM5	10.32	21.38
BM7	30.15	30.12
BM8	55.56	38.56

All times are in seconds and done over a series of days — these are the average of the times obtained. The speed of the machine is 4 MHz. I hope these are of use to you.

I now know that there is very little difference between the two languages. The BBC Basic (Z80) cost only £95 + VAT and will run on most CP/M machines. This package was purchased from M-Tec Computer Services.

One big advantage is that my son (16) can now get going on his O-level project at home and not bother with the school's BBC machine and the 10,000 other children trying to get their program done.

I would be interested to know if any other readers have had experience with this version of BBC Basic.

Ian Masters, Thetford,
Norfolk

Adopting Lisp

I was very interested by A Sandison's article on Genealogy in the April PCW.

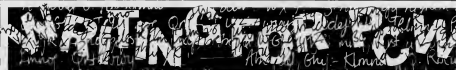
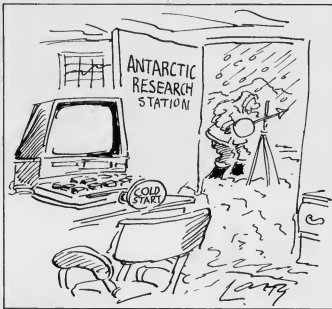
I have often thought about producing a program for recording family history. But after turning over in my mind several different methods I eventually settled on a very different approach to Mr

Sandison's.

The major difficulty in using any of the usual languages (eg, Basic, Cobol, Pascal) seems to be the problem of how to represent the relationship between records in such a way as to still allow great flexibility in changing or adding to the data. For example, if I should suddenly want to add details of my great-grandfathers' sisters this should be possible without major surgery on the program. I'm not sure that a coding system like the one Mr Sandison proposes is the best approach, it tends to be too rigid and artificial, though it is not easy to improve upon if one is confined to Basic.

I would suggest that it is worthwhile taking a look at the facilities offered by Lisp. I recently bought the Lisp tape for my BBC computer and it seems to provide exactly the type of data structures needed for a family tree and lacking in Basic. I must admit that since I have not as yet been able to obtain the manual my ideas have not been tested in practice and Lisp is new territory for me despite over 10 years in D.P. However a careful reading of *LISP* by Winston & Horn (which I recommend) has made me reasonably confident in this approach.

Richard Grubb, Newark,
Notts



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HARDWARE

A J Simmonds details a simple Centronics interface for Video Genie and TRS-80 Model 1 micros.

CENTRONICS HOOK-UP

I have had a Video Genie for a year now, but I have only just bought a printer (a Tandy Lineprinter VII with Centronics interface). I could not afford both an expansion interface and printer, so I decided to build an interface circuit to connect between the Video Genie expansion interface bus and the printer's Centronics port. There are interface circuits which you can buy to do this job, but the circuit is relatively simple, so I decided to build it myself and put the money I saved towards a disk drive! The circuit can also be used by a TRS-80 Model 1.

The Video Genie uses port FDH (decimal 253) for the printer, the TRS-80 Model 1 uses memory location 37E8H (decimal 14312). Normally this causes no problems for the Genie user, but for EDTASM it is a problem since EDTASM uses its own printer driver routine (not the ROM routine) and naturally expects the printer to be at

37E8H. This was done so the EDTASM could be used with both Level 1 and Level 2 Basic. It's possible to rewrite EDTASM for the Genie; the changes necessary are to replace LDA, (37E8H) with IN A, (FDH) for the printer status check, and to replace LD(37E8H), A with OUT (FDH), A to print a character. However a simpler way is to do it in hardware, by OR'ing the TRS-80 printer address decoding with the Video Genie printer port address decoding. The circuit is shown in Figure 1. I suggest that first you try getting the circuit to work with the LLIST and LPRINT commands, and then try adding the circuitry for EDTASM. For a TRS-80 Model 1 you only need the address decode circuitry as shown for EDTASM.

This circuit has been built and tested. It worked first time and, assuming there are no mistakes in the diagram and you check your wiring before you switch on, it should

work first time for you. Just in case you do make a wiring mistake, it's best to use IC sockets.

All chips should be low power Schottky TTL (74LS series) since they are to be powered from the interface pins to save the need for a separate power supply. In Figure 1 the chips are identified by their type, eg, 123 is a 74LS123; if there are more chips of the same type then they are numbered, eg, 30-1 and 30-2 are both 74LS30. ICs 123, 241 and 367 should be powered from pin 18 (+5v) of the Centronics connector. All other ICs should be powered from pin 19 (Vcc) of the Genie expansion bus. Pins 1, 2, 49 and 50 of the Genie expansion bus and pins 19-30 and 14-17 of the Centronics connector provide the earth and should be connected together. The Lineprinter VII only provides a Busy signal for the status, hence the other status signals (Fault, Unit Select and Out of Paper) are constant

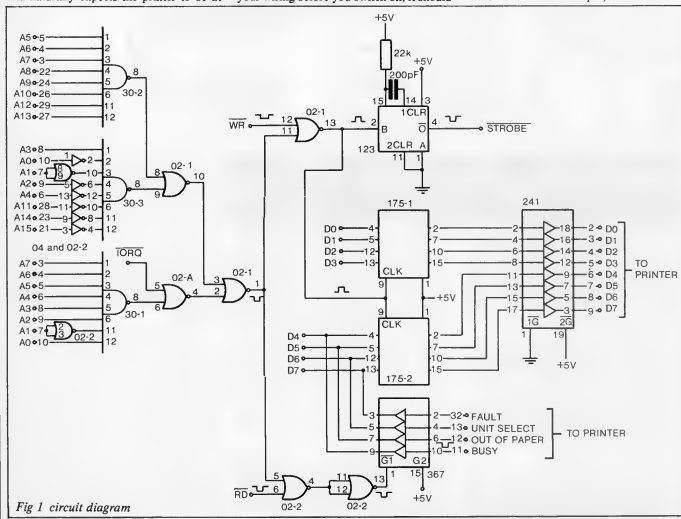


Fig 1 circuit diagram

IC	+5v	earth
04	14	7
30-1	14	7
30-2	14	7
30-3	14	7
02-1	14	7
02-2	14	7
175-1	16	8
175-2	16	8

+5v from pin 19 Genie expansion bus.

IC	+5v	earth
123	16	8
241	20	10
367	16	8

+5v from pin 18 Centronics connector.

Fig 1 Power connections

Printer Status	Active	Centronics Pin	Lineprinter VII
Fault	low	32	high
Unit Select	high	13	high
Out of Paper			
Busy	low	11	Busy

Fig 2

volts. The Centronics interface is designed for reasonably long connections, so I have a 2m long cable. The Genie expansion bus on the other hand is not — I think 10 centimetres of cable is the maximum it can cope with. You will need a 36-pin AMP connector for the Centronics interface, 2m of 36 or 37-strand cable, 10cm of 50-strand cable and a 50-pin female connector for the Genie expansion bus. To connect the 50-pin connector to the cable you will need care, a vice, and perhaps right at the end a hammer!

As for the circuit description, IC 30-1

1	gnd	26	A10
2	gnd	27	A13
3	A7	28	A11
4	A6	29	A12
5	A5	30	phi
6	A4	31	print
7	A1	32	nc
8	A3	33	nc
9	A2	34	phlda
10	A0	35	phantom
11	D5	36	halt
12	D2	37	pwait
13	nc	38	IORQ
14	D1	39	phold
15	D0	40	WR
16	D3	41	RD

Fig 3 Video Genie expansion bus

detects when port FDH is addressed (on address lines A0-A7) for a Genie printer request. ICs 30-2 and 30-3 together detect when address 37E8H is addressed (on address lines A0-A15) for an EDTASM printer request (ie, exactly as a TRS-80 Power Connections

Model 1). IC 123 produces a longer strobe than the WR pulse; this is necessary because the Centronics interface is slower than the Genie expansion bus (hence it can be longer). IC 175-1 and IC 175-2 hold the data byte (on D0-D7) till the printer has acknowledged (by setting Busy low) that it has received the byte. IC 241 is a buffer to stop reflections on the Centronics connector from upsetting the flip-flops in IC 175-1 and -2. IC 367 is a tri-state buffer to gate the printer status onto the data lines (D4-D7).

Naturally other ICs could be used instead, eg, a 74LS122 retriggerable monostable instead of the 74LS123 dual retriggerable monostables, two 74LS04s instead of the 74LS241, latches instead of the master-slave 74LS175s and so on. However,

17	D7	42	ccdbb/
18	D6	43	stadb/
19	VCC	44	mreq
			dodbs/
			adbs
20	D4	45	ml
21	A15	46	reset
22	A8	47	rfsb
23	A14	48	nmi
24	A9	49	gnd
25	nc	50	gnd

Expansion pin edge viewed from rear side:

2	50
1	49

1	strobe	19	gnd	(pair with pin 1)
2	D0	20	gnd	" 2
3	D1	21	gnd	" 3
4	D2	22	gnd	" 4
5	D3	23	gnd	" 5
6	D4	24	gnd	" 6
7	D5	25	gnd	" 7
8	D6	26	gnd	" 8
9	D7	27	gnd	" 9
10	ack	28	gnd	" 10
11	busy	29	gnd	" 11
12	out of paper	30	gnd	
13	unit select	31	nc	
14	gnd	32	fault	
15	gnd	33	nc	
16	gnd	34	nc	
17	gnd	35	nc	
18	+5v	36	test	

Fig 4 Centronics parallel connector

it is better to have a built and tested circuit to work from rather than someone's idea of what might work. I hope you have fun building this circuit, and even more out of using it.

PRINTER SPRINTER

Andrew May describes an interrupt-driven Centronics interface.

The disadvantage of running programs which send results to a printer is that a printer is considerably slower than the computer for outputting data. It is possible to obtain printer buffers to speed this up but they usually cost between £100 and £200.

The hardware and software described in this article were developed in an attempt to decrease the time spent by my Nascom computer sending data to the printer. It does this by reserving a section of memory as a buffer to store data which has been output by the computer but not yet sent to the printer. The printer interrupts the computer when it is ready for more data thereby enabling the computer to be effectively processing at the same time.

The program used is given in Listing 1. It is assembled to run in the free memory between 0C80 and 0F80 on a Nascom system and will run on any system running using either the NAS-SYS 1 or NAS-SYS 3 monitor. Memory up to 0D00 has been left free because several other programs use this as work-space.

Two pointers STRTXT and ENDTXT

store the addresses of the start and end of text within the buffer. When text is stored in the buffer the start of text pointer is incremented and when text is output to the printer the end of text pointer is incremented. If either pointer reaches the end of the buffer then it is wrapped around to the start again.

The size of the buffer can be changed by changing the values at the end of the program. At present it is set up as a 16k buffer between locations 5000 and 8FFF, this is the end of memory on a 32k system. A larger buffer means that more data can be output before the buffer is filled, an advantage if a large number of results are to be printed.

The software is divided into three main parts. The first, starting at INTLZE, initialises the PIO as an output port and sets it up to generate interrupts. It also stores the address of the output routine AOUT in the NAS-SYS output routine vector. As a result, every time a character is sent to the screen the same character is sent to the printer. The routine can be turned on

by means of the monitor 'U' command and off again by the 'N' command.

The main output routine, AOUT, stores the character to be output in the buffer. When the buffer is full a HALT instruction is executed. This causes the computer to wait until the printer is ready and can accept the next character from the buffer.

The interrupt routine, INTRPT, is executed when the printer informs the computer that it is ready for the next item of data. The routine takes the next available character from the buffer and sends it to the printer.

The Z80 processor has three interrupt modes, however the two simplest, modes 0 and 1, both cause jumps to zero page memory. Since the Nascom system for which the program was written has ROM between 0000 and 07FF these modes were unusable. It was for this reason that Interrupt mode 2, the most complex, is used in the program.

When an interrupt occurs in mode 2, the interrupting device, in this case the Z80 PIO, supplies the processor with an eight bit value. The processor combines this with

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PRINTER SPRINTER

an eight bit value stored in the I register and uses the resulting sixteen bit address as a pointer to find the address of the interrupt routine. Although complicated it does mean that the Z80 can service up to 128 different devices, enough for most applications. If other interrupts are to be used in the same system then their addresses should also be stored in the table.

The circuit used (fig 1) serves two purposes. It provides buffering between the PIO and the printer so if anything should go wrong the PIO is not damaged, and, by the use of a monostable it converts the handshaking signals used by the PIO to those required by the printer. This is necessary because the Z80 PIO provides a signal RDY which goes high when data is available on the port and goes low after that data has been read and acknowledged by the peripheral bringing the STB line low. However the printer requires that the STROBE line be brought low for at least 1µs and then taken high again before it will read the data. The monostable provides this facility, the length of the pulse being determined by capacitor C1.

Because the 7417 buffer used has open-collector outputs it is necessary to pull the outputs high if this is not done within the printer. Use 1k resistors to the +5v supply or alternatively leave the buffers out

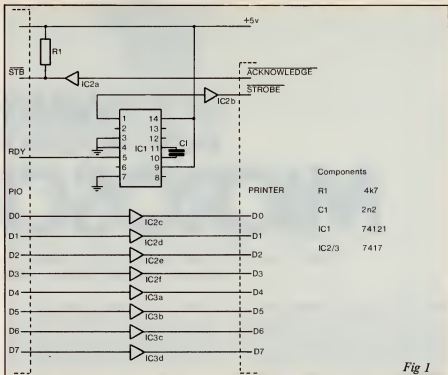


Fig 1

altogether since they are not absolutely essential.

Although designed for a Z80 system driving a Centronics 739 printer there is no reason why both the hardware and software should not be adapted to run on any system

with a parallel port driving a printer with a Centronics interface. On some systems not using a Z80 PIO the hardware may even be unnecessary if it is possible to program the port to produce the required signals. The effort is certainly worth while.

```

0000      0000      ;*****
0001      0001      ; Interrupt driven *
0002      0002      ; CENTRONICS printer *
0003      0003      ; interface. *
0004      0004      ;
0005      0005      ; Andrew Mau 16/2/83 *
0006      0006      ;
0007      0007      ;
0008      0008      ;
0009      0009      ORG 0000
0010      0010      ;
0011      0011      ;
0012      0012      ;
0013      0013      ;** INITIALIZE PIO **
0014      0014      ;
0015      0015      ; Set up NAS-SYS
0016      0016      LD HL,A0UT      ;Output vector
0017      0017      LD A,8F
0018      0018      OUT (7),A      ;PIO Port 5
0019      0019      LD A,8F
0020      0020      OUT (7),A      ;PIO interrupts
0021      0021      LD A,8F
0022      0022      OUT (7),A      ;PIO interrupts
0023      0023      LD A,8F
0024      0024      OUT (7),A      ;PIO interrupts
0025      0025      LD A,8F
0026      0026      OUT (7),A      ;PIO interrupts
0027      0027      LD A,8F
0028      0028      OUT (7),A      ;PIO interrupts
0029      0029      LD A,8F
0030      0030      OUT (7),A      ;PIO interrupts
0031      0031      LD A,8F
0032      0032      OUT (7),A      ;PIO interrupts
0033      0033      LD A,8F
0034      0034      OUT (7),A      ;PIO interrupts
0035      0035      LD A,8F
0036      0036      OUT (7),A      ;PIO interrupts
0037      0037      LD A,8F
0038      0038      OUT (7),A      ;PIO interrupts
0039      0039      LD A,8F
0040      0040      OUT (7),A      ;PIO interrupts
0041      0041      LD A,8F
0042      0042      OUT (7),A      ;PIO interrupts
0043      0043      LD A,8F
0044      0044      OUT (7),A      ;PIO interrupts
0045      0045      LD A,8F
0046      0046      OUT (7),A      ;PIO interrupts
0047      0047      LD A,8F
0048      0048      OUT (7),A      ;PIO interrupts
0049      0049      LD A,8F
0050      0050      OUT (7),A      ;PIO interrupts
0051      0051      LD A,8F
0052      0052      OUT (7),A      ;PIO interrupts
0053      0053      LD A,8F
0054      0054      OUT (7),A      ;PIO interrupts
0055      0055      LD A,8F
0056      0056      OUT (7),A      ;PIO interrupts
0057      0057      LD A,8F
0058      0058      OUT (7),A      ;PIO interrupts
0059      0059      LD A,8F
0060      0060      OUT (7),A      ;PIO interrupts
0061      0061      LD A,8F
0062      0062      OUT (7),A      ;PIO interrupts
0063      0063      LD A,8F
0064      0064      OUT (7),A      ;PIO interrupts
0065      0065      LD A,8F
0066      0066      OUT (7),A      ;PIO interrupts
0067      0067      LD A,8F
0068      0068      OUT (7),A      ;PIO interrupts
0069      0069      LD A,8F
0070      0070      OUT (7),A      ;PIO interrupts
0071      0071      LD A,8F
0072      0072      OUT (7),A      ;PIO interrupts
0073      0073      LD A,8F
0074      0074      OUT (7),A      ;PIO interrupts
0075      0075      LD A,8F
0076      0076      OUT (7),A      ;PIO interrupts
0077      0077      LD A,8F
0078      0078      OUT (7),A      ;PIO interrupts
0079      0079      LD A,8F
0080      0080      OUT (7),A      ;PIO interrupts
0081      0081      LD A,8F
0082      0082      OUT (7),A      ;PIO interrupts
0083      0083      LD A,8F
0084      0084      OUT (7),A      ;PIO interrupts
0085      0085      LD A,8F
0086      0086      OUT (7),A      ;PIO interrupts
0087      0087      LD A,8F
0088      0088      OUT (7),A      ;PIO interrupts
0089      0089      LD A,8F
0090      0090      OUT (7),A      ;PIO interrupts
0091      0091      LD A,8F
0092      0092      OUT (7),A      ;PIO interrupts
0093      0093      LD A,8F
0094      0094      OUT (7),A      ;PIO interrupts
0095      0095      LD A,8F
0096      0096      OUT (7),A      ;PIO interrupts
0097      0097      LD A,8F
0098      0098      OUT (7),A      ;PIO interrupts
0099      0099      LD A,8F
0100      0100      OUT (7),A      ;PIO interrupts

```

```

0000      0000      ;*****
0001      0001      ; Interrupt driven *
0002      0002      ; CENTRONICS printer *
0003      0003      ; interface. *
0004      0004      ;
0005      0005      ; Andrew Mau 16/2/83 *
0006      0006      ;
0007      0007      ;
0008      0008      ;
0009      0009      ORG 0000
0010      0010      ;
0011      0011      ;
0012      0012      ;
0013      0013      ;** INITIALIZE PIO **
0014      0014      ;
0015      0015      ; Set up NAS-SYS
0016      0016      LD HL,A0UT      ;Output vector
0017      0017      LD A,8F
0018      0018      OUT (7),A      ;PIO Port 5
0019      0019      LD A,8F
0020      0020      OUT (7),A      ;PIO interrupts
0021      0021      LD A,8F
0022      0022      OUT (7),A      ;PIO interrupts
0023      0023      LD A,8F
0024      0024      OUT (7),A      ;PIO interrupts
0025      0025      LD A,8F
0026      0026      OUT (7),A      ;PIO interrupts
0027      0027      LD A,8F
0028      0028      OUT (7),A      ;PIO interrupts
0029      0029      LD A,8F
0030      0030      OUT (7),A      ;PIO interrupts
0031      0031      LD A,8F
0032      0032      OUT (7),A      ;PIO interrupts
0033      0033      LD A,8F
0034      0034      OUT (7),A      ;PIO interrupts
0035      0035      LD A,8F
0036      0036      OUT (7),A      ;PIO interrupts
0037      0037      LD A,8F
0038      0038      OUT (7),A      ;PIO interrupts
0039      0039      LD A,8F
0040      0040      OUT (7),A      ;PIO interrupts
0041      0041      LD A,8F
0042      0042      OUT (7),A      ;PIO interrupts
0043      0043      LD A,8F
0044      0044      OUT (7),A      ;PIO interrupts
0045      0045      LD A,8F
0046      0046      OUT (7),A      ;PIO interrupts
0047      0047      LD A,8F
0048      0048      OUT (7),A      ;PIO interrupts
0049      0049      LD A,8F
0050      0050      OUT (7),A      ;PIO interrupts
0051      0051      LD A,8F
0052      0052      OUT (7),A      ;PIO interrupts
0053      0053      LD A,8F
0054      0054      OUT (7),A      ;PIO interrupts
0055      0055      LD A,8F
0056      0056      OUT (7),A      ;PIO interrupts
0057      0057      LD A,8F
0058      0058      OUT (7),A      ;PIO interrupts
0059      0059      LD A,8F
0060      0060      OUT (7),A      ;PIO interrupts
0061      0061      LD A,8F
0062      0062      OUT (7),A      ;PIO interrupts
0063      0063      LD A,8F
0064      0064      OUT (7),A      ;PIO interrupts
0065      0065      LD A,8F
0066      0066      OUT (7),A      ;PIO interrupts
0067      0067      LD A,8F
0068      0068      OUT (7),A      ;PIO interrupts
0069      0069      LD A,8F
0070      0070      OUT (7),A      ;PIO interrupts
0071      0071      LD A,8F
0072      0072      OUT (7),A      ;PIO interrupts
0073      0073      LD A,8F
0074      0074      OUT (7),A      ;PIO interrupts
0075      0075      LD A,8F
0076      0076      OUT (7),A      ;PIO interrupts
0077      0077      LD A,8F
0078      0078      OUT (7),A      ;PIO interrupts
0079      0079      LD A,8F
0080      0080      OUT (7),A      ;PIO interrupts
0081      0081      LD A,8F
0082      0082      OUT (7),A      ;PIO interrupts
0083      0083      LD A,8F
0084      0084      OUT (7),A      ;PIO interrupts
0085      0085      LD A,8F
0086      0086      OUT (7),A      ;PIO interrupts
0087      0087      LD A,8F
0088      0088      OUT (7),A      ;PIO interrupts
0089      0089      LD A,8F
0090      0090      OUT (7),A      ;PIO interrupts
0091      0091      LD A,8F
0092      0092      OUT (7),A      ;PIO interrupts
0093      0093      LD A,8F
0094      0094      OUT (7),A      ;PIO interrupts
0095      0095      LD A,8F
0096      0096      OUT (7),A      ;PIO interrupts
0097      0097      LD A,8F
0098      0098      OUT (7),A      ;PIO interrupts
0099      0099      LD A,8F
0100      0100      OUT (7),A      ;PIO interrupts

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MICROSCRIPT

Kathy Lang tries out an Irish package that proves a worthy competitor to the new wave of American imports.

MicroScript is the word processing member of a family of packages supplied by Intelligence (Ireland), to run under CP/M. It has been selected by DEC for inclusion in the catalogue of software for the Rainbow, running on the Z80 processor, and versions for the 8086 under both CP/M-86 and MS-DOS are, I'm told, very near completion.

MicroScript provides a large range of editing functions to create and modify text, which is displayed formatted on the screen during editing within the margins which will be used to print the document. Page formatting is handled at print time. MicroScript has a calculating facility and a powerful macro command system. It has a good many superficial resemblances to Wordstar, which also displays text within the margins which will be used at print time (in contrast to Peach Text, SpellBinder and Lexicom, the other major CP/M word processing packages, which keep editing and text formatting quite separate). Since many readers will know something about Wordstar already, I'll comment on any obvious comparisons as I describe MicroScript's facilities.

When you first run MicroScript (after it has been set up to run with your terminal and printer — more on this process anon) the screen shows a menu of options including 'Create a file' and 'Edit a file' — two separate functions, which I personally prefer to having the same command to do both. If you try to create a file using a name which already exists, MicroScript responds with 'bad file name' — better than overwriting it, but not very helpful. Once the file has been set up, MicroScript displays a blank screen for you to type your text on.

Although it is actually using a 'ruler', containing the margin positions and tabs, this is not displayed unless you request it. While you are typing, MicroScript is in 'overwrite' mode unless you alter this — that is, new characters overtype existing text rather than being inserted. The usual 'word wrap' feature is used to stop you having to worry about line endings.

Editing

MicroScript used a 'function' approach to editing which is very similar to that used by

Wordstar, where each function, such as delete a character, move the cursor a word, etc., is carried out by one key or set of keys. (This contrasts somewhat with SpellBinder and Lexicom, which tend to have just one key for delete or move, and to vary the unit of movement — by character, word, sentence, etc.)

MicroScript provides a total of 54 instructions which the user can give to move the cursor, move text, invoke command processing (a species of macro facility which enables you to instruct the program to execute a sequence of commands as if they had been entered from the keyboard) and so on. Each of these functions is described under a sequence number in the manual and a list by number is shown in Figure 1. It depends on your implementation of MicroScript what keys are pressed to invoke these commands.

Each copy of MicroScript uses a command file in which is stored a mapping of these function numbers onto keys on the keyboard. This command file is a plain text file, so of course the user can change the mapping as often as he or she likes; this makes it very easy to personalise the program in the way best suited to individual needs. However, I thought it a pity that there was no 'default' mapping, parallel to the use of CTRL keys in WordStar, so that no one can use the manual without having to have at hand the list of commands for the particular terminal. It also makes it harder for people who regularly need to use more than one machine.

The cursor can be moved up or down a line, to the top or bottom line of the screen, to the screen 'Home' position or to the bottom right hand corner of the screen. It can be moved left or right a character or word, and to either end of the line. Movement by character or word is not circular — for instance, you can't go 'left a word' when the cursor is at the left-hand end of the line. You can move the cursor to the top of the document, but not — curiously enough — to the end; I got round this (when I remembered) by marking the last line with a unique character which I then 'found' when I came to add more text. This is made the more necessary as there is no provision for scrolling — text moves if the cursor is moved into areas which are not

currently on the screen, but text cannot be moved around the cursor. For the Wordstar devotee, there is no equivalent of CTRL-C and CTRL-R. I 'programmed' equivalents for myself using the abbreviation memories, but the scroll back was very slow as it refreshed the whole screen for each line moved.

As I said, the 'default' is to type corrections over existing text; if you want to insert, there are four ways of doing it. You can open up just enough spaces to overtype the text to be inserted, you can insert enough blank lines to make room, or you can 'elbow' the text to the right of the cursor onto the next line. You can also go into 'insert mode' in which text is always inserted rather than overtyping (this mode lasts during the editing of one paragraph or until you switch it off — and there is no 'visual clue' as to what mode you're in apart from what happens to the text itself). I had a few problems when using insert mode — it works all right within a paragraph, but at the end of a paragraph the 'blank line' between that paragraph and the next gets overwritten, and any 'part line' (such as a heading between paragraphs) gets absorbed into the text. Text can be deleted a character, a word, or a part or the whole of a line at a time, and also by marking a block of text and moving it into the 'cut buffer'. Text can also be converted from upper to lower case or the reverse — a feature I found very useful, as there is no CAPS LOCK light on our Sirius so you are often unaware you've hit CAPS LOCK by mistake.

The 'cut buffer' is part of the facilities for block movement. Text can be cut, copied, or cut leaving a blank area behind. Once in the cut buffer, text can be pasted down elsewhere, either overlaying the text already there or inserted. The cutting works on the basis of a rectangle of text, with text being moved from the top left hand corner to the bottom right hand corner of the area marked. This works fine for column movement and for whole lines, but is rather a pain for phrases or sentences which occupy less than a line (when using the technique outlined means that you lose the rest of the line) or which span line endings — you have to cut more than you need, and delete the surplus. The cut buffer cannot cope with more than 23 lines of text at a time, so if you

want to move more than that you must do it in stages.

Whole files of text can be read into MicroScript at any time — these can be just text, or commands and text intermixed. You can't however, write text out to another file directly while editing — to do this, you must store the text in the cut buffer (which is preserved across file closure), exit from the edit, edit another file and paste the contents of the buffer in the new file.

The cut buffer is a special form of internal memory. Another kind of buffer is used to store abbreviations. There are 10 permanent memories, each the size of a screen line, which are initialised in the command file and which cannot be changed within a MicroScript editing session, and another 10 volatile memories which are available for storing abbreviations during an editing session. For instance, I stored the word MicroScript while writing this review. Storage and recall each involve a single function call — one or more key-strokes, depending on how your system is set up. These memories can be used either for text or for commands or for a mixture of the two — so you can put into the memories frequently used sequences of commands to speed up the editing process.

There is a facility to FIND a string of text. To do this, you type the desired string along on a line, place the cursor on it, and issue the FIND command. The search is always forwards, but you could of course issue a 'top of document' command first. There is a FIND and REPLACE function outside the editor — a simple global 'find and replace' invoked through the menu. However, you could easily use the abbreviation memories to store both your find and your replace strings to do a continued find and replace, with discretion as to whether to allow the replace to take place.

In addition to straightforward editing, you can also use MicroScript as a calculator. It has 10 calculator memories, to store intermediate results, and its operation is very similar to that of a simple pocket calculator with arithmetic functions. This facility could be extremely useful for work involving tables of figures included in running text.

Formatting

Text is formatted on the screen within the margins which will be used at print time. You can have word-wrap with ragged or justified margins, tabs and an indent in the ruler line. The indent works only for the first line in the paragraph, and in fact can be an outdent instead of an indent — this would be very handy for 'bulleting', where you have a list of points, each starting with an asterisk or bullet, with the left margin two places in from the bullet. The ruler used can be retrieved and altered at any time. Up to 10 rulers can be stored in ruler memories, and rulers can be saved as lines stored in the edited file.

There are some very good features here — for instance, a ruler is activated by having the cursor pass down through it. So to make sure all the text is edited using the correct rulers, all you have to do is to recall a ruler, modify it to suit your needs, and

1	Return	28	Re-format
2	Delete	29	Store ruler
3	Cursor left	30	Recall ruler
4	" right	31	Use ruler
5	" up	32	Underline
6	" down	33	Underscore
7	Tab	34	Page feed
8	Push-text	35	Wipe right
9	Pull-text	36	Wipe left
10	Tab right by word	37	Delete word
11	Tab left by word	38	Goto top-left of screen
12	Delete line	39	Call merge file
13	Open line	40	Enter insert mode
14	Goto right end of line	41	Elbow line
15	Goto left end of line	42	Exit insert mode
16	Goto top of screen	43	Goto end of text on screen
17	Goto bottom of screen	44	Expand line
18	Caps convert	45	Find text
19	Lower "	46	Store abbr.'n'
20	Cut/paste mark	47	Recall abbr.'n'
21	C/P lift-blank	48	Alt.mode 'n' on
22	C/P lift-leave	49	Alt.mode 'n' off
23	C/P lift-remove	50	Quit document
24	C/P put-overlay	51	Recall document name
25	C/P put-insert	52	Save document
26	C/P put-elbow	53	Goto top of document
27	Centre line	54	Call CMD text

Fig 1 MicroScript functions

leave it in the file — it won't be printed, and it will be acted upon next time you come to edit the file. I think this is much better than the Wordstar approach, where you need a slight 'dodge' to store a ruler properly at all, and it is only activated when you expressly request it. To format a paragraph to a ruler, you put the cursor anywhere in the paragraph and give the reformat command.

So far, so (very) good. Unfortunately, there are also some obscure features with MicroScript formatting. To start with, you can only change the right margin by changing the ruler, and the system does not recognise that a line is a ruler line while it is being edited; so to modify a ruler, you must edit it while using a ruler with a right margin equal to or greater than the right margin you want in your new ruler. To create a new ruler from scratch, you must be using a ruler which has the right margin set at 79 (the maximum which can be displayed on the screen), as a ruler must have a character in every position for the full width of the screen. I kept one ruler specifically for this — but I had to edit the command file outside MicroScript to do that, as the rulers which come with the system don't include one with the maximum width line.

Another problem is that you must have the whole of the text you want to reformat on the screen, plus the succeeding blank line, when reformatting — to reformat a long paragraph (more than 23 lines) you must do it in two bits. MicroScript is very fussy about cursor position when the reformat command is issued, when adding text at the end of a document. You must have finished the paragraph off with a blank line, when the cursor will be two lines away from the bottom of text, then move the cursor back to at least the last line of the paragraph, before issuing the reformat

command. To get round this I stored one of the abbreviation memories a sequence consisting of two carriage returns, two cursor up commands, and the reformat — but a bit more imagination would have rendered that unnecessary, and I was using my abbreviation memories up rather quickly on command fudges. I was particularly sorry about this glitch, as finding the beginning of a paragraph is something Wordstar does not do well, and it's on the whole been much better thought out in MicroScript.

Reformatting includes right justification if that's in the ruler. There is, however, no hyphenation facility — the package doesn't even recognise word-joining hyphens as characters where lines can be split — so some of the spacing leaves a bit to be desired. But probably the worst feature is the way emphasis is treated. If you want to underline a word, you must underline the whole line; a line of hyphens is displayed on the next line, and you must then edit this line to give just the emphasis you want. But this line of hyphens is just an ordinary text line, and the hyphens, plus the character at the end of the previous line which tells MicroScript to overtype with the next line, are part of the text — so if you reformat that paragraph later you get the hyphen/underlines mixed in with the text. . .

Facilities for tables are quite good. I've already mentioned that the method of block movement is better suited to column work than to moving plain text. You can have tabs anywhere, and the indent feature could also be useful in this context — a big improvement on Wordstar's CTRL-O/G facility. It's a pity, though, that there's no provision for displaying at least the column position of the cursor on the screen — such a help when setting up tabs. The other

MICROSCRIPT

drawback comes if you have wide tables. MicroScript can't cope with text wider than the screen except by being told that the next two (or three or more) lines constitute a single, wide line, so you can't 'pan across' a 'wide' line on the screen, as there's no horizontal scrolling either. Whether this would affect you depends on your particular needs.

Pagination is handled at print time. So you can't see the page boundaries while you're editing, though you can 'view' then on the screen instead of actually printing the document. For me this is a major drawback, especially as, although there is a 'new page' command, there is no 'conditional page' break (start a new page if there are fewer than 'n' lines left to print). Headers and footers, and the positioning of the page number, are also included at printing time, as is common practice in most word processors.

Standard paragraphs and letters

Here the programming features of MicroScript come into their own. Any command which you can type into MicroScript can also be placed in a file, and read in as part of the editing process. These merged files can be 'indexed' so that you can select only a paragraph or two by dint of a unique reference. Merge files may call other merge files to a depth of seven calls. However, there is no conditional execution — unconditional jumps yes, conditional jumps no — and a range of features are made impossible by the inability to write a file while editing another. There are also no direct facilities for extracting several items from the same 'record' in a merged file; the way round this is to 'index' each item, or to use the abbreviation memories or the facilities for requesting input from the

keyboard. I felt that for slick processing of this kind you'd do better to combine with another package such as MicroPen, reviewed elsewhere in this issue. The facilities of MicroScript are I think better adapted to problems such as standard paragraph work, where the ability to string together a selection of standard paragraphs would be invaluable — far superior to Wordstar's ability to string together only complete files. As you might expect, files can also be merged at print time.

The facility to store commands in files is accomplished by giving each special symbol, such as CONTROL or ESCAPE, a 'visible equivalent' which can be edited into a file. You can also put MicroScript into a 'learn' mode, in which control functions entered at the keyboard are not acted upon but displayed in their 'visible equivalent' form — I thought this could be a very useful way to set up a control file.

Printing

A variety of features, such as emphasis and headers and footers, are acted upon at print time. The 'print menu' allows you to enter at print time definitions for such items as number of lines on the page, space between text and footer, and so on. These items include double spacing; there's no special provision for anything other than single and double spacing, but you can embed in the text instructions to the printer for special situations such as sub- and super-script, and these same provisions could be used to initiate other changes in print characteristics. These instructions are given using one of up to 22 special character variables provided for this purpose. You can ask for multiple copies from the print menu, too. But you can't print one document while editing another — not necessarily such a bad thing, as this is usually better handled by having a large printer buffer so that printing doesn't interfere with keyboard interactions.

Housekeeping

When editing a file, MicroScript keeps a copy of the old version for the time being. It only has one 'backup' file, though, so this contains the old version of the most recently edited file.

When it comes to explicit file operations, MicroScript provides the main requirements from its menu: you press F for file management and get a second menu of options, including copying, replacing and 'merging'

(which is actually copying one file and appending the second to the copy). Strangely, it doesn't provide for a 'change logged drive' facility, so all file names must be prefixed by the drive if they are not on the drive containing the programs. You can't get round this except by having a copy of the program on every data disk, as MicroScript uses several program files chained together, all of which assume that MicroScript is on the logged drive.

Software user image

I found MicroScript quite easy to use once I had had some practice — but it did take quite a bit of learning. I think someone who didn't use a word processor regularly would find it harder, especially remembering the functions and the keys which invoke them. The system uses very little prompting, too — for instance, when using the 'find' facility, you just type the string you want to find on an empty line, and press the find function key.

I've mentioned the lack of 'clues' about things such as whether you are in 'insert' or 'overtyping' mode. However, the lack of display of rulers, prompts and other system paraphernalia does mean that you see only your text on the screen, and many people will prefer that. The system of storing and retrieving rulers, abbreviations and calculations was straightforward and easy to use. I did, though, think the emphasis method very clumsy, and the way formatting treats emphasis lines is a real pig's ear — especially as the system has the clues to tell it that a line is an overtyping line.

I personally find it a real nuisance that page-breaks aren't displayed while editing, especially when there is no provision for conditional page-breaks or automatic prevention of 'widows' and 'orphans' (headings at the foot of a page or the last line of a paragraph at the top of a page). Given the philosophy of specifying page size at print time, page-breaks could not be displayed accurately during editing, which is why I prefer to be able to specify in the file — it also means you only have to set the printing parameters once for a document that uses an unusual page size or whatever.

Documentation and support

The manual was clear and simple in the main 'use of MicroScript' parts; its main disadvantages are an almost complete lack of examples, and also that it keeps quiet on some pretty important points — the problems with rulers, for instance, I found out the hard way. As is usually and regrettably the case, there is no index — which didn't help in finding my way around. The sections on setting up the terminal and other adaptations of the command file were very badly documented, and I found that quite a tough operation — I understand that much thought is currently going into making this much easier to do. Support is provided by Intelligence at an annual fee — see the Summary Box. This covers all updates, a magazine and a proper hot-line service by

Benchmarks

BM1	10
BM2	55
BM3	100
BM4	20
BM5	155
BM6	158

All timings in seconds. For an explanation of Benchmark timings, see PCW April 1981.

Summary

Package Type	Word processor with command processing; text formatting during edit.
Facilities	Editing, formatting, storage of rulers, abbreviation memories, calculator, command processor, file merge.
Ease of Use	Mixed. Few prompts, but predictable in use once basic commands learnt.
Error Messages	Few and far between.
Documentation	Clear, but not everything explained; no index; installation section inadequate (soon to be replaced).
Costs	£275 including 90-day warranty. Support contract £150 p.a. for software updates, newsletter and 'hot-line' telephone support.
Supplier	Intelligence (Ireland) tel. Dublin (0001) 988555.

telephone to Dublin; training courses are available too, in London and Dublin and elsewhere if demand warrants it, but these are charged separately.

Conclusions

MicroScript is for me rather a curate's egg of a package — good in parts. Some sections of the software are excellent — such as the abbreviation memories, the ruler facilities, the calculator and the command processing and standard paragraph features. Some of these could have been made even better with a little more thought — the ability to carry out conditional execution, for instance, would make a big difference to the flexibility of the command processing. I didn't like the restrictions to 23 lines on paragraph work and block movement, and I didn't like the problems I had with insertion — especially the fact that 'insert mode' is turned off for

you without your being told. I also disliked very much the procedures for underlining and emboldening.

So how would these facilities work for the four archetypal users featured in these reviews? The author/journalist should find the editing adequate, though some features might not be quite to his or her taste; the fact that you get just your text on the screen would probably be a plus point, and an author would be likely to find features like the abbreviation memories invaluable — I did when writing this article. The ruler features were on the whole very good, but nevertheless the writer of technical reports might not find the formatting features adequate, especially aspects such as the lack of control over page layout. The manager might find the system a bit hard to learn, though perhaps he or she could be taught a simple subset. The secretary — well, that would depend on the application. Legal secretaries and the like would find the

power of the command system invaluable (though they might like it even better with conditional execution). Other office environments would be more or less suited to MicroScript depending on factors such as the value of the calculating facilities and the abbreviation memories versus the lack of control over page layout.

All in all, for a first issue the current version of MicroScript is way ahead of the first issue of most of the existing competitors — but of course they've been around a lot longer. The CP/M word processing scene has been pretty quiet for a while in terms of new issues, but it seems that MicroScript is in the vanguard of a new wave. As a European product I wish MicroScript luck, in competition with other new products such as the American package Perfect Writer (already here) and other imports promised soon including one from Ashton Tate, the authors of dBaseII.

END

NUMBERS COUNT

TRIANGULAR, TETRAHEDRAL AND FIBONACCI NUMBERS

Mike Mudge continues his series of puzzles for the maths freaks among us.



The positive integers consist of 1, 2, 3, 4, 5...; a general number in this sequence will be noted by l, m or n .

The Triangular Numbers, denoted by T_l , represent the number of identical spheres that can be packed into a complete triangular array having l rows. Thus $T_1 = 1$, $T_2 = 1 + 2 = 3$, $T_3 = 1 + 2 + 3 = 6$, and in general $T_l = 1/2 l(l+1)$.

The Tetrahedral Numbers, denoted by t_m , represent the number of identical spheres that can be stacked in a complete triangular pyramid, or tetrahedron, having m layers — each a complete triangle. Thus $t_1 = T_1 = 1$, $t_2 = T_1 + T_2 = 1 + 3 = 4$, $t_3 = T_1 + T_2 + T_3 = 1 + 3 + 6 = 10$, and in general $t_m = 1/6 m(m+1)(m+2)$.

In contrast to the above numbers, which are essentially geometrical in origin, the Fibonacci Numbers, denoted by F_n , are here defined algebraically using a recurrence relation $F_{n+1} = F_n + F_{n-1}$ where $F_1 = F_2 = 1$. That is, any term in the Fibonacci sequence is obtained as the sum of the two previous terms. Thus $\{F_n\} = \{1, 1, 2, 3, 5, 8, 13, 21, \dots\}$; this sequence has so many interesting properties that it has its own publication, *The Fibonacci Quarterly*.

PROBLEM

This month's problem is in three distinct parts, which are seen to have a common logical thread.

- Which tetrahedral numbers are also triangular numbers (eg, $T_1 = t_1 = 1$, $T_4 = t_3 = 10$)? This problem has been attributed to W Sierpinski, 1970, and others.
- Which Fibonacci numbers are also triangular numbers (eg, $T_1 = F_1 = 1 = F_2$,

$T_2 = F_4 = 3$, $T_6 = F_8 = 21$)? This problem is due to Vern Hoggatt.

c) Which Fibonacci numbers are half the sum or difference of the cubes of two integers — eg, $1 = 1/2(1^3 + 1^3)$, $8 = 1/2(2^3 + 2^3)$, $13 = 1/2(3^3 - 1^3)$? This is closely related to the abstract problem in number theory of finding all quadratic fields of class-number 2.

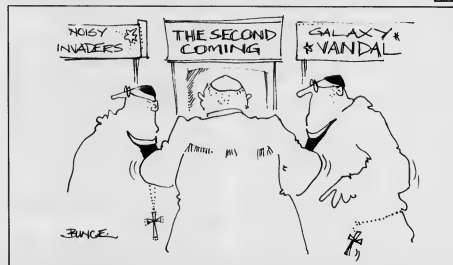
Submit a program, or suite of programs, which generates answers to the above questions up to some maximum positive integer, N , whose value may be input data. All submissions should include program listings, hardware descriptions, run times and output; they will be judged for accuracy, originality and efficiency (not necessarily in that order). A prize of £10 will be awarded to the 'best' entry received within two months of the appearance of this article.

Submissions to: Mr M R Mudge BSc, FIMA, FBSC, Room 560/A, Department of Mathematics, The University of Aston in Birmingham, Gosta Green, Birmingham B4 7ET.

Note: Submissions will be returned only if suitable stamped addressed envelopes are included.

Response to the first article in this series was predictably sparse; however, the 'best' entry has been chosen as that of Robert Merson of Farnham, who combined some subtle algebraic transformations with a factoring technique to reveal:
 $428 = (-117091)^3 + (-111433)^3 + 2(114332)^3$
 $491 = (13584908)^3 + (13476659)^3 + 2(-13531000)^3$
 $580 = (89845)^3 + (85111)^3 + 2(-87542)^3$
 A cheque for £10 will be sent to Robin.

END



SOUND ADVICE

AUDIO-VISUAL DOCUMENTATION PACKAGES

Maggie Burton takes a preliminary look at a new way of getting the most from your micro — by using a tape recorder.

These days it seems as if anyone and everyone is holding his nose and jumping head first into the pool of computer technology. How on earth do people learn to cope with it at home and at work?

The need for universally applicable, convenient and inexpensive teaching methods is becoming more apparent as the months go by.

In businesses where whole departments (or the whole business if it is small) are being computerised, employees have to be trained somehow, and it is far safer if this is done properly. All too often a secretary is taught to use a word processor by a hurried boss or harassed colleague — and then proceeds to make mistakes, lose files, corrupt disks . . . the list goes on. Similarly, new employees, particularly young ones, need decent training if they are to perform tasks well. This applies to everything — not just computers — which can be considered a skill.

And in people's homes, too, where computers are even more on the rampage. How many homes, one wonders, have ZX81s or VIC-20s stashed in cupboards and under sofas for want of a bit of simple tuition?

It's not always easy to grasp what a manual is trying to put across — especially as the documentation is frequently the last and most hurried part of producing a computer (or software package) for consumer retail. It's also often inconvenient for people to go to evening classes and impossible to pay through the nose for expensive courses.

One way of learning a skill is to buy a packaged course. These generally consist of a cassette containing a recorded lecture (or series of short lectures) in a friendly voice, a supplementary (sometimes necessary) book and often a book or books of exercises to go with the course. Some of the computer ones come with demonstration software on floppy disks and those based on software (eg, Wordstar as reviewed by Steve Harris elsewhere in this issue) need the package to be up and running if they are to be effective.

Possibly the first area in which this type of training was applied was foreign languages (we've all heard of Lingua-Phone). Flicking through magazines in your dentist's waiting room reveals audio-course ads for guitar playing, fiction writing, typing and even self-hypnosis tapes. Sometimes these are regarded with a measure of amused scepticism but they keep selling and new ones appear from time to time.

The big disadvantage with any form of self-teaching is that it requires patience and self-discipline. It's very easy to give up or

devote less and less time to the subject, ending up finally leaving the course matter redundant and gathering dust in some dark corner of home or office. A few suppliers are now producing audio courses as a key element of their training strategy.

One company which has now applied self-training principles to a company environment is ICL. Through its Traderpoint retail outlets it is now selling a series of training packs based around audio cassettes and book courses. These cover CP/M, Wordstar (this package is actually the same as the Sound Training Wordstar pack reviewed by Steve Harris), Microsoft Basic, CIS Cobol and Pascal. An MP/M course is on the cards for the near future.

These are available either to the man in the street or to companies and will be translated into some foreign languages — namely German, French, Spanish and Italian — in future. Prices range from £50 to £105.

Most of the courses are independent of micros — although it is desirable to have a computer to hand right from the start. The CP/M 2.2 course is the exception as it is practically oriented and needs not only a version of CP/M but also a blank disk as well to be used and kept as a workdisk. Andy Street of ICL says "Wordstar is probably the most popular and CP/M comes a close second". It's easy to see what people need to learn about.

As subject matter is arranged around several cassette sessions, a more knowledgeable student can leave out the first parts of a course and get straight down to the more complex lessons. A novice can theoretically start from scratch and not be frightened by techno-jargon.

Furthermore the manuals included can adequately serve as permanent frames of reference either if something is forgotten or simply for guidance when needed.

Before I go on to make observations on the courses, I'll make it clear that my comments are initial judgements and can't be called a full review. In a later issue when I've completed the Pascal course a review will be published. I know almost nothing about Pascal. If, by the time the course is complete, I've got more than a passing familiarity with Pascal and the possibility of learning far more about actually programming using the language, then the course will be considered a fair investment.

Thus far I've listened to the introductory tapes on Pascal and CP/M and read through the manuals.

The Pascal course begins with a general introduction to high level languages. This I found interesting and informative although

it could be a little too much for a complete beginner to take in all at once. In this case it would have to be run through again, which is one of the blessings of the audio cassette training method. If you don't understand something straight away you can stop and go through it again and again at your own pace.

The wording on the tapes is very formal and the voice sounds a little terse — almost as if the chap's giving a lecture using scant notes in front of a seething crowd of drunk students. In short, he sounds nervous. And as it's the same voice for all the courses this is a bit of a disadvantage though he's friendly enough.

The book provided is well set out with plenty of space for scribbled notes in the margin (in pencil, please!) but it is mainly dependent on the cassettes — at least at first.

It provides the bare bones of the information disseminated in the course and the flesh is added to it by the voice which goes through the book step by step fleshing out the bare bones on the page. Diagrammatically presented information is used extensively, which is easier to understand than plain text.

As the tape has to be stopped occasionally so that an exercise may be performed it would be helpful if the book included boxes for recording tape positions. This would save time if one broke off after finishing an exercise when the course was resumed.

The book ends with a complete summary of Pascal syntax, error reports, debugging hints and a concise index. These are the parts which would be the most useful on a permanent basis to someone who had completed the course and progressed to writing Pascal programs. Time is also given to outlining differing versions of Pascal.

The CP/M course is set out along similar lines and includes two cassettes instead of the six provided for Pascal.

As with the Pascal course it goes into considerable detail on companies and authors involved in development of software. Once again the wording is a little 'high level' for an absolute novice. An example is a reference to 'specific machine types' and a 'de facto industry standard' in operating systems. It talks about these things before outlining what an operating system actually is. When it does get around to that it's in a lot of detail and could be hard to pick up if you didn't already have some idea.

As it's a practical course the book is mainly stocked with copious screen pictures as examples of what should be happening while CP/M is being used. It provides useful details on memory and



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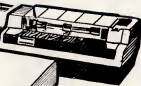
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ACORNSOFT

SOUND ADVICE

where CP/M is loaded, diagrams on how to use STAT, PIP, SUBMIT and so on, finishing up with a glossary of terms.

ICL's courses are rather formal although they are comprehensive and would probably be better suited to the training of larger numbers of employees within a big company.

A choice which may well be preferable for individual use — either in the home or small business — would be the National Computing Centre's Business Basic course. This is definitely better than ICL's courses if you want an introduction to the principles of the computer.

It consists of one computer, a book to go with it, a book of 'application studies' and their answers, and two copies of a quick reference card which can be used to tailor the course to your own system.

A computer is really essential if you want to derive the full benefit of this course, but that is a logical requirement only if you want to learn to program. It would still teach a beginner a good deal about micros and the Basic language if they had no system.

The cassette is dependent on the book although the latter would almost suffice on its own. The tape provides a sort of friendly commentary and much of its material is contained verbatim within the book. Regular example programs are set out and con-

sidered as each part of Basic is dealt with.

Every so often you stop the tape — noting the counter number in a box provided — and read some of the book or do an exercise. A lot of pictures are provided — one of the first, incidentally, shows someone inserting a disk into a drive the wrong way — which make the book look helpful and amusing to use.

Generally I would imagine this is a fun course to do and it does go into plenty of depth — slowly. It's much more designed for the confused or simply completely innocent computer user than the more advanced ICL courses. In actuality you could learn more from ICL's product but for some individuals it might take a little longer.

The NCC only produce the one course — that outlined above. While ICL estimates it has sold a total of approximately 3,500 copies of various courses from its series, the NCC's Jill Baker says Business Basic is 'very popular' and estimates that about 20 copies are sold per month. Many of these are apparently sold to home computer users.

Although course content, accuracy and approach are all very important, with this method it is the pupil who determines the probability of success. Self-discipline is the order of the day.

Audio courses, though, are an easier

learning option than reading a book. It's a simpler matter to sit and listen to a voice telling you something than to pore over a book to find out that something yourself. In addition, although you may think most of what you've heard has gone in one ear and out through the other, it's surprising how much you can pick up without realising it.

Sound Training, ICL and the National Computing Centre are the only organisations I can discover who sell audio courses relating to computers. There may be some others. If there are, they're not making very much noise about themselves. There will probably be more springing up in future as new software appears and more companies decide to jump onto the micro bandwagon.

Meanwhile if you feel this method of learning is for you (or your employees), the National Computing Centre's Microsystems Centre supplies Business Basic — tel 01-353 0013 — and ICL courses can be discussed by contacting Andy Street on Windsor 68181 ext 179.

Prices

	exclusive of VAT
Business Basic (inc VAT)	£19.50
ICL Pascal	£105
ICL CIS Cobol	£130
ICL Microsoft Basic	£70
ICL CP/M 2.2	£50
ICL Wordstar	£50
	END



continued from page 113

(Black has a clear advantage because of its domination of the a7-g1 diagonal, preventing White from castling.)

13 Qd1-c2 0-0
14 Nf3-g5 Ne7-g6

(Possibly more natural is 14...g7-g6, followed by ...Ne7-f5 and eventually ...Nf5-d4 or ...Nf5-c3, as appropriate.)

15 a2-a4 Bc5-e7?

(A serious retrograde step. 15...Bc5-e3! would be very strong, for example 16 g2-g3 d7-d5!, and if 17 Bc4xd5 Qb6-a5+. Another possibility is the immediate 15...Bc5-b4+, keeping the white king stranded in the centre and saving a tempo.)

16 a4-a5 Be7-b4+
17 Kc1-f1

(The first critical position.)

17 ... Bb4xa5?!

(Dangerous, because after White's next move Black's defence needs very accurate handling. I would have been tempted to

ignore the a5 pawn, which is vulnerable in the long term in any case, and concentrate on attempting to take advantage of the exposed position of the white king. But computer programs are terrible materialists, and the temptation to grab a pawn is normally too much for them to resist.)

18 h2-h4!

(The best chance. White is a pawn down and its king is precariously placed, so the only hope is to take advantage of the pressure on f7 (knight and bishop) and h7 (knight and queen). Now we have the second critical position.)

18 ... h7-h6??

(There seems little wrong with 18...Qb6-b4! (threatening mate on e1) 19 Bc1-e3 d7-d5! 20 e5xd6 (or 20 Bc4xd5 Bc8-d7, with threats of ...Bd7-b5+ and ...Ra8-c8) 20...Bc8-f5 21 Qc2xf5 Qb4xc4+ 22 Kf1-g1 Ba5-b6 23 Bc3xb6 axb6, when Black still stands better. Of course, not many chess programs would examine this 11-ply sequence, but I would have thought that a number would reject 18...h7-h6 as being too weakening. The text allows White to turn the tables, a chance which Mephisto grabs with alacrity.)

19 h4-h5! Qb6-b4
20 Bc1-c3 d7-d5

(Now this try is too late.)

21 h5xg6 h6xg5

(Everything else is inadequate, eg: (a) 21...Bc8-f5 22 Bc4-d3 Bf5xd3+ 23 Qc2xd3 h6xg5 24 g6xf7+ Rf8xf7 25 Qd3-h7+ Kg8-f8 26 Qh7-h8+ Kf8-e7 27 Qh8xa8; or (b) 21...d5xc4 22 g6xf7+ Rf8xf7 23 Ng5xf7 Kg8xf7 24 Qc2-a4, with a decisive material advantage in each case.)

22 Bc4xd5 g5xf4
23 g6xf7+ Rf8xf7
24 Be3-c5

(Threatening 25 Qc2-h7 mate.)

24 ... Qb4-b5+
25 Kf1-g1 Qb5xc5+
26 Qc2xc5 Ba5-b6

(Now all of Black's pieces are pinned: the f7 rook against its king on g8, the a7 pawn against the rook on a8, and soon the bishop on c8 against the king.)

27 Qc5xb6 a7xb6
28 Ra1xa8 g7-g5
29 R8xc8+ Kg8-g7
30 Rh1-h8

(Threat 31 Rc8-g8 mate.)

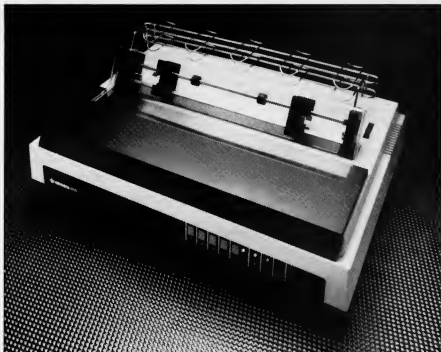
30 ... Rf7-f8
31 Rc8xf8 Kg7-g6
32 Bd5-e6 b6-b5
33 Rf8-g8 mate.

END

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LEARNING BY EAR

Steve Harris plugs in his tape recorder, sits back and listens . . .

'Offputting' is one of the kinder words used to describe the manual that comes with MicroPro's Wordstar package. But it's an ill wind that blows no publisher any good, and there is no shortage of books designed to present Wordstar in a less intimidating way. Some offer a glossy, jocular approach, with the central assertion that learning is fun, and wrap the technicalities in a sugar coating of cosy chat. Others are more austere, proceeding along a very straight line of instruction to a series of exercises in producing business letters and tabular documents.

To quote from *Introduction to Wordstar* by Arthur Naiman, a writer of the word-processing-can-be-fun persuasion: 'Wordstar has just about every bell and whistle you get with any other word processing system, and then some.' The point is, of course, that to start using Wordstar you can't learn how to blow all the whistles straightaway — what you need as a beginner is something that will show you how to do on the screen what you could do on paper, and how to achieve this as painlessly as possible.

If you've got a patient and sympathetic teacher to show you everything, digging you out of the pitfalls as you go, there's no problem. If you're on your own and learning from a book, you've got to have something that either won't let you make mistakes — very improbable — or which will allow you to find your way out of them without having to read from cover to cover. But any independently produced training aid is likely to fall foul of some problems anyway because it cannot take detailed account of all the different micros that users may be learning on or of updates and refinements in the software itself.

The 'Sound Training' Wordstar instruction package aims to get new users processing words without expensive personal tuition but with a more personal and inviting approach than a written manual, and now claims to meet the needs of both Wordstar II and Wordstar III users. It is produced by Communications Projects (1 The Elms, Tillington, Hereford), which will also shortly be publishing similar packs for Mailmerge/Mailprint, Wordcraft and 'Introducing CP/M'.

The Sound Training pack is basically two audio cassettes giving a total of nearly two hours of spoken instruction with written material for back-up and reference. This comprises a manual containing work-

ing examples and a transcript of the four cassette sides, a set of 'Checklist' cards covering basics such as disk care, starting up and shutting down, and a set of 'Job Aids' cards summarising Wordstar commands. The whole lot comes in a durable spiral binder and it is designed to sell to those who want an aid to train others as well as to first-time users themselves. It costs £23 including VAT, with additional copies available at £16.68. In either case it assumes no prior knowledge of computers on the part of the trainee, but does assume familiarity with typewriting and office routines, and supposes that there will be someone to set up the computer before you start.

Once you (or the trainee) have booted the system, have a program disk in drive A and a formatted data disk in drive B, and know where the reset button is, you are ready to start listening to the tapes.

Side one offers a fear-allaying introduction — 'Don't worry, you won't break anything and you won't cause a disaster if you press the wrong button' — which instils the idea that you are 'in the driving seat' and that the tape will allow you to work at your own speed. It explains that word processing is just a way of writing, amending or editing and storing documents just as you can do on paper. This section also very simply describes the functional relationship between disk drives, screen, keyboard, printer and the computer itself without getting tangled up in the usual terminology of ROM, RAM, operating systems and programs.

Your first instruction is to key in 'WS' to load Wordstar and bring up the no-file menu on the screen.

Before discussing the contents of the menu, the tape does attempt to explain clearly that the characters you enter at this stage are instructions to the computer, not data, and to get over the concept of files and file names. However, it interrupts and confuses this with an instruction to key in H0 (help level zero), which means that Wordstar's on-screen display of commands will be suppressed when you start working on a file. This is not explained until later.

The menu — 'The list of things you can choose to do' — is quite well handled, as is the explanation of the confusingly ungrammatical shorthand term 'Editing no file' — though it would have been a good idea to have stated here that the term 'editing' includes starting a new document file as well as amending an existing document.

As an example of how the main menu works, the tape instructs you to run the STAT program to give you the number of unused bytes remaining. So, at last, you are nearly ready to start working on a document. But not quite: first, the tape has to explain the 'help level', which it has earlier told you to set at zero. With help level set at 3, Wordstar displays all menus and commands — but the tape tells you to keep it at zero because 'I've found that sometimes Wordstar provides almost too much help. . . You spend more time reading the prompts than typing text.'

Once you've opened a document file, you are required to copy-type in a 12-line piece of text from the front of the manual, which gives you something to start editing. This is all right as long as you notice that there are two spaces after each full stop and you don't make any other mistakes. Although you are told not to worry if you make mistakes, if you don't type the text in exactly as specified the subsequent instructions on editing it are likely to be confusing. It seems likely that a lot of trainees are going to call for help around this point, and it is here that the idea of replacing a teacher at your shoulder with a voice on a tape tends to fall down.

However, assuming you get the text on the screen without problems, trainees should have no trouble following the tape as it steadily runs through single-character amendment procedures. Wisely, the tape teaches you how to save and print before getting on to the further subtleties of Wordstar. This ends the second side of the tape. Side three teaches you how to format a business letter — going through scrolling, quick cursor movement, reforming and so on. Side four gets on to some of the 'bells and whistles' of Wordstar — moving blocks of text, setting margins, quick finding and other printer options.

So does Sound Training really work? If you are an experienced operator who needs a time-saving way of training others from scratch, it will probably work well and justify the cost. In this situation you, as supervisor, can explain the complications that arise — for example, the use of cursor keys and other function keys which, if provided, make Wordstar a lot easier.

In the early stages you can also clear up conceptual confusions about the nature of the operating system, programs and files. I can't help thinking, though, that setting the help level to zero straight away is a bad idea. Once a trainee understands the principles, it's a lot easier to refer to menus on the screen than to consult the Sound Training 'Job Aid' cards.

If you want to teach yourself Wordstar from scratch, the Sound Training method is less satisfactory. You'll still need some initial help and someone to turn to in case of difficulty, and you still need the written material. A well-organised book could well be a better and cheaper bet. Trying to rely on the tape alone would be a bit like trying to find your way through a complicated inner-city one-way system with only verbal instructions such as 'first left, second right', and with street names hardly mentioned; you really need a map.

END



BANKS' STATEMENT

HIGH TECHNOLOGY? WE ARE NOT IMPRESSED

Martin muses on office automation, and considers eggs, baskets and Bedouins.

I have a theory. I don't for one second suppose that it is truly original, but I would claim to be the first person that I know of to have written it down, in a book I once produced.

The theory goes along the following lines: people will not accept any new development, technology or product which they can see no immediate use for or benefit from. This will be despite the fact that other people (especially the people who have developed and/or are selling the product) can see perfectly well the advantages to be gained.

A good example of this theory in action is viewpoint. For those that are used to computers and computing, the use and manipulation of information and the need to gain access to vast amounts of it quickly and easily, the potential advantages of the technology are immediately apparent.

Disregarding any arguments about the specific technical capabilities of viewpoint as available in this country, it has been seen that marketing it purely as a 'product' has not worked. The majority of the general public — who were expected to jump at the chance of acquiring and using this new technological wonder — have however barely risen above their normal somnolent state to give it a cursory inspection and a judgement of 'Uh?'.
They have, in practice, seen little point in having vast gobs of 'information' available for which they could see no immediate or specific purpose. Only if they find an application specific to their own requirements, and only if the product — in this example viewpoint — solves that applications problem, will the product as a whole then be investigated.

The same can be said of personal computers — or more specifically personal computers for use in business, commerce and the professions. I have used before the phrase that the industry has been 'bought from' rather than having to 'sell to' the marketplace, and this situation is probably about to change. In the market sector relating to business and the professions, and especially those professionals that work within large company structures, the 'selling to' is now starting, and there are some suggestions that it will not be as easy for the manufacturers of personal computers to break into this business as it has been for them to create from nothing the personal computer market *per se*.

At first sight this may appear somewhat odd; for the personal computer has already proved to be a big hit in the small business sector and the professions. Certainly it is true that the majority of purchasers have

had either a clear idea, or reasonable grounds to suspect they had an idea, of what they wanted to achieve. They were the users who were 'buying from' the industry.

There are many, many more users of the 'small business' type yet to move towards the computer, and that total is but a flea-bite to the potential sales that exist within the walls of the large companies — the multinationals and their kin. This is the market that needs to be 'sold to'.

The majority of users, either individually or collectively, do not 'know' what they want. Oh sure, they want a computer system that will help them with their job, if only they can actually work out what it is that they do. They also, perhaps, want one for status reasons. They have trouble, however, actually identifying what it is the computer will be doing for them. Though they would possibly like one, they are not sure that they need it, or why.

Most of the rest just won't want one. They will see a computer as a threat, or as a status machine that has no relevance to them. There will be only a few (no doubt the pre-converted that have bought the likes of a Sinclair, VIC, or Dragon) who will positively want one of these new-fangled things.

For many large companies it will be worse, for they have a need to maintain, above all, some coherence in their corporate structure. Adding a new technology into the workings of the administration, financial control and product development areas of a company is a subject they will see as needing to be tackled very slowly.

Some estimates suggest that it could be 20 years before what we in the industry blithely refer to as 'office automation' is a normal and accepted part of a company's organisational structure.

And 20 years is a long time for some companies that are happily pinning their colours to the office automation mast to wait for their ship to come in.

There is a question here, one that goes roughly along the lines of '20 years?'. The reason the answer could be 'yes' is in the theory at the beginning of this piece. Office automation is concept built on almost infinite variation of physical implementation, and it could be many years before clear, coherent and provably workable approaches to its implementation are developed. At present, nobody really wants office automation. They have nothing against it, they just don't understand it and therefore they see no real need to have it around.

The trouble is that many of the basic

tools of office automation now exist and are being actively sold to customers. In certain applications they are already successful, particularly in the small business area where one computer is now sufficient to perform the majority of tasks required by a small company.

In larger companies they are also being successfully applied to defined applications such as word processing.

These are all just scratching the surface, however, for office automation in its fullest sense will require not just the tools but the infra-structure. It will also require the experience of failed automation attempts to provide the true definition of how, where and why it should be applied. At the moment, the industry is trying to sell farming equipment to a Bedouin. If he could learn that he could probably make a better living staying still and cultivating some land then he might buy all the farm equipment going. At the moment he sees no reason to stop being a nomad, thank you very much.

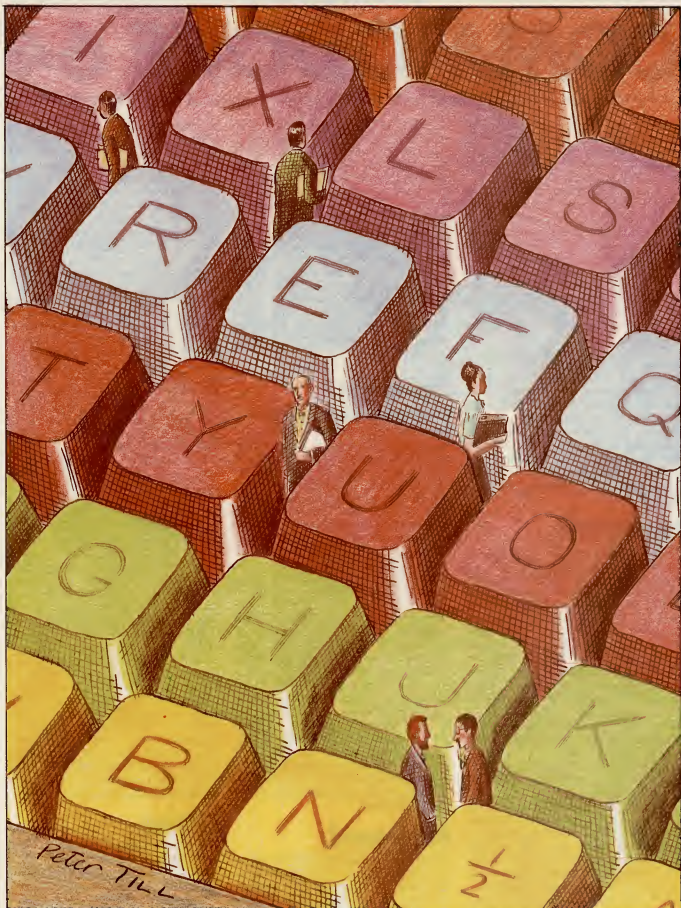
Even important elements of office automation infra-structure like local area networks fit into this picture. They are, indeed, somewhat like viewpoint — everyone feels sure that they are important because they provide rapid communications facilities, but what do you communicate? How do you use the great gobs of information generated and available?

Answer these questions, and the way to apply the technology should come as a natural by-product.

But without coherent answers, it becomes questionable as to whether any or all of the tools so far produced will have any relevance in the long term. For example, personal computers as we currently know and love them — 8 or 16-bit boxes oriented towards individual man-machine interaction via such painful objects as the keyboard — may prove to be entirely the wrong type of 'tool' on which to base office automation. What if it proves to be something as yet undefined, like a speech I/O terminal connected optically to a processor that itself uses optical logic based on arithmetic to the base 4, derived from the four primary colours? I don't know — maybe somebody is working on it.

What is currently true is that several companies are beginning to pin an enormous amount of faith on office automation becoming a big market, and becoming one very soon. That in itself is a considerable act of faith, but it could be seen as being compounded by another, that their products are the right ones for such a 'market'.

BANKS' STATEMENT



It has to be noted that one company in particular, Apple Computers, is aligning itself almost totally with the office automation market. Apple III and the revamped Apple IIe are office-oriented machines, and the new Lisa — a grand, if expensive, lady

of considerable talents — greatly enhances and expands the company's product capability in that area.

It has, however, put a lot of expensive eggs into one, as yet fairly intangible, basket. There are those in the industry who feel

that the basket is not actually there yet — or if it is it could prove to be the wrong shape to hold these particular eggs.

END

BENCHTEST

COMMODORE 64

A home computer or a small business system? Mike Curtis looks at the latest contender to the VIC-20.

The first sight of the Commodore 64 brings an immediate sense of déjà vu; it is almost identical in appearance to the very popular VIC-20, in fact some dealers have been advertising it as the VIC-64.

Viewed in this context the new Commodore machine would look to be a sure winner in the current race to put more and more memory into a small, home computer package. The price of £344.95, however, would seem to exclude competition with the Sinclair Spectrum, Dragon and other similar machines and pit the new Commodore against the BBC, Newbrain and other more "serious" machines, with an educational and small business market in mind.

Commodore itself sees the machine as a low-end business machine, which can be taken home at weekends and can double as a high quality home computer, rather than the opposite. It must be borne in mind though, that a large and successful company like Commodore can afford to be flexible on prices, as when it slashed the price of the VIC-20 not so long ago. In a year or two's time when the VIC has reached its limit the price of the 64 may come down.

Hardware

The Commodore 64 comes in a large multicoloured box like the VIC, and when removed from its packaging material reveals itself in a light brown-grey case 16" by 8" and a maximum of 3" high. Most of the top is taken up by a full size qwerty keyboard. The keys are a chocolate brown colour apart from four function keys to the right of the main keyboard which are a shade lighter. This only leaves room for the Commodore 64 name at the top left and a single LED labelled "power" at the top right. The appearance is attractive and functional and clearly it is intended to blend in well with any office or home environment.

There is a separate power supply in the same type of strong plastic and the same colour as the computer.

A multitude of connectors can be found on both the right hand side and the back. On the side are the power socket next to a small on/off switch, and a pair of 9-pin sockets labelled control port 1 and control port 2 where joysticks and light-pens can be connected. At the back, reading from left to right as you look at them, are a cartridge slot, a small screw head which can be used to select the channel for the TV display, a phono-socket for the UHF TV signal, and two DIN sockets. One DIN socket carries both a composite video output to drive a monitor and an audio signal which can be plugged into a

hi-fi. The other DIN socket functions as a serial port into which can be plugged a VIC printer or a VIC disk drive. Also at the back are two edge connectors; one for the cassette interface and the other for the "user port" into which can be put various interface cartridges such as a modem or RS232. These should be familiar to any VIC or even PET user.

As usual on Commodore machines it is very easy to connect a whole range of Commodore peripherals to the 64, though other peripherals are more difficult. But it should be possible to connect, for example, a daisywheel printer via the RS232 cartridge in the user port slot. The Commodore 64 uses the same C2N cassette unit as the VIC.

Using the Commodore 64

The only thing necessary to get the Commodore 64 working is a 13 amp plug. The leads from plug to power supply and from power supply to computer are reasonably long and another long lead is provided to plug into the aerial socket of your television. The television must be tuned in to the computer's signal as usual, though this did not in my case turn out to be quite at the familiar spot of channel 36 that other machines use.

When all is working properly the screen clears to display a light blue border of about 1" surrounding a darker blue rectangle with the heading COMMODORE 64 BASIC V2 and the message that you have 38911 BASIC BYTES FREE. This to some extent makes nonsense of the claims to offer 64k of memory. Even using Assembly language the Commodore 64 can offer you only 48k of useable memory, but this is no worse than the majority of other machines; indeed it compares quite favourably with the 33080 bytes that MBasic leaves me on my 64k CP/M machine. The lettering and the cursor are in the same light blue as the border, the cursor flashes by inverting whatever is on the screen under it.

Keyboard

The keyboard is laid out almost identically to that of the VIC. At the bottom left is the Commodore key with the Commodore logo, which has several control functions; above is a key labelled RUN/STOP; there are SHIFT, SHIFT LOCK and CONTROL keys also on this side. On the right hand side are keys labelled CLR/HOME, INST/DEL and RESTORE as well as RETURN and another SHIFT; there are two cursor control keys at the

bottom right, one for up and down, the other for left and right. The letter keys carry two graphics characters on their front. The numeric keys situated along the top, carry colours except 9 and 0 which have RVS ON and RVS OFF. The four function keys on the right of the main keyboard are labelled F1 to F4 but also carry a sub-label of F5 to F8. Clearly each key has a number of different functions.

The machine powers up with the keyboard in Upper case/Graphic mode; text is displayed in upper case only, using the SHIFT key gives access to the right hand of the two graphics characters on the letter keys, but the normal shifted characters above the numerals. In this mode CONTROL can be used with numerals 1 to 8 to set the colour of characters displayed to the colour shown on the key; the colours in this main colour set are black, white, red, cyan, purple, green, blue and yellow. CONTROL and 9 will reverse the display, CONTROL AND 0 will restore it to normal.

The mode can be switched to upper/lower case by pressing the COMMODORE key and the SHIFT key together; in this mode upper and lower case characters are available from the letter keys using the SHIFT key as normal, but using the COMMODORE key instead of the SHIFT key gives access to the graphics character on the left of each letter key. The alternative set of eight colours is now available on the number keys, these being orange, brown, light red, grey 1, grey 2, light green, light blue, and grey 3. The COMMODORE and SHIFT keys will switch back to Upper/Graphic mode.

The COMMODORE key is also used when loading cassettes. The RUN/STOP key can be used to stop a Basic program while running and can be used for a warm restart in conjunction with the RESTORE key. The INST/DEL key acts as a backspace-delete or when shifted it will move text one space to the right inserting a space. The CLR/HOME key takes the cursor to the top left corner of the screen and when shifted it also clears the screen.

Editing

Full screen editing is available as standard. The two cursor keys, in conjunction with the SHIFT key which is conveniently right beside them, can be used to correct or enter text or graphics characters anywhere on the screen. When RETURN is pressed the contents of the line under the cursor are taken as input as though they had just been typed. This works even if the "line" is in fact longer than the 40 characters allowed on the screen.

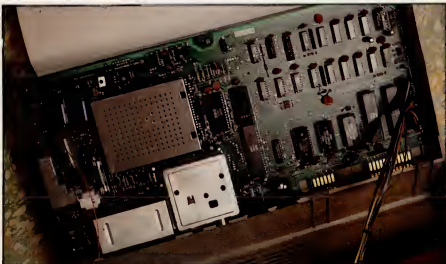
The only keys which repeat are the



Photography by Ian Dobbie



The keyboard is laid out almost identically to that of the VIC.



Inside the overall impression is of solid reliability.



Most of the top is taken up by a full size qwerty keyboard.

COMMODORE 64

cursor keys and SPACE. This confused me for a while, being used to auto-repeat on all keys, but I got used to it very quickly. The only snag I found was after making a change and moving the cursor back down using the RETURN key as is my habit; every line is re-entered as it is

passed including READY which is interpreted as READ Y and produces an "Out of Data" error message. The keyboard looks and feels solid and easy to use, though the keys did not "click" positively enough for my taste.

Display

The display was good with edges being quite reasonably sharp and text clear.

There are 25 rows of 40 columns, which is about the most that you can get out of a domestic television. The colours are bright and clear though I could discern a rainbow effect looking close - my television is getting a bit old though, and I have found a number of machines that give better displays when put on a more modern set. I tried the display on a black and white monitor and got a crystal sharp effect. I am surprised that there seems to be no immediate provision for an 80 column display which I would have thought at least desirable, if not necessary for serious business use.

Software

The Basic in this new machine will also come as no surprise to VIC or PET users; it is the standard Version 2 Commodore Basic which does look a bit antiquated now. Variable names can be any length, but only the first two characters are significant. Strings can be up to 255 characters. Integer variables are available using the %, but no double precision limiting real values to 9 digits (10 held internally). There are no control structures apart from FOR ... NEXT, GOTO and a simple IF ... THEN..., and no named procedures.

Input and output can be directed to any of the available ports, so giving easy control of printers, joysticks and other devices. The tape interface is quite standard for Commodore machines, though running at a different speed. It worked perfectly throughout the test. I did not have the opportunity to try the disk unit but it should work here as well as it does on the VIC.

COMMODORE 64

There are two system variables TI and TIS, that give access to a real time clock. TI contains the number of units of 1/60 sec since the machine was switched on. TIS is a 6 character string containing the time in hours, minutes and seconds. It starts at 0 but can be assigned a value to set the time. A further system variable ST contains information on input/output status which can be used to detect errors, though no details of how to do this are given in the manual.

The Benchmarks show that the 64 is in fact a little slower than the VIC but still quite reasonable compared to its main competitors. The major lack however is the almost complete absence of commands to handle the extensive graphic and sound capabilities of the machine. The only way to achieve effects is extensive use of PEEKS and POKES and although the manual goes into some detail about the various memory locations and registers which can be used for these purposes the method is very cumbersome compared to the commands available on say the BBC Micro or the Dragon.

Compatibility

The advantage of retaining the same basic language as the VIC and the PET is, of course, that the machines then become software compatible. It means that the 64 will be able to use not only the vast range of games and home programs for the VIC but also the large quantities of good business software available for the PET. The software will in general not be immediately transferable, because the PEEKS and POKES will be different, as will any USR functions or SYS calls, but it should be fairly easy for a reasonably competent home-programmer to transfer a VIC program and no doubt software to do it will become available soon. Software to make the 64 emulate a "new ROM" PET has already been announced by Commodore. A warning though that the cassette speeds are different so VIC software must be transferred via a disk.

Future add-ons

The faults with the Commodore 64 Basic will also be cleared up, for disk based systems anyway, by another new item of software called "Simon's Basic" which should be available from this April. This will give structured programming, named procedures and direct commands to handle graphics and sound. I would have preferred to see this as the standard. Other projected software includes a number of games and educational programs, obviously carried over from the VIC. But emphasis is given to a new range of software especially written for the new machine including a word-processor, a spreadsheet, a data-management package and a spelling checker as well as other languages such as UCSD Pascal, Logo, Pilot, Comal and Lisp. Even more impor-

tant is the projected Z80 add-on card which will provide the 64 with access to CP/M and unlimited software.

Other projected add-ons include RS232, IEEE and Prestel interfaces and networking capabilities. Speech synthesis is promised for this September and voice recognition for the following January. Dates may well be moveable as always in this business, but clearly the 64 will be the centre of a very sophisticated computer system with access to a very large software base.

Inside

Taking the lid off the 64 means undoing three screws at the front. Then the top comes off with the keyboard which is a separate unit. The lead on the keyboard is not quite long enough to be able to lay top and bottom side by side but it disconnects easily, as does the lead to the power LED.

Inside is a single board occupying the whole space. The processor is a 6510A, a development of the 6502 used in other Commodore machines. Memory comes in the now standard form of $8 \times 64k$ dynamic RAM chips. There are the usual cluster of peripheral control devices and a total of 20k of ROM in three chips. The video circuitry is on its own and screened by a metal case from the rest of the machine as are some of the external connectors. The whole is surrounded by what I can only describe as a sheet of conducting cardboard. This is clearly a professional job as you would expect from a company like Commodore and the overall impression is of solid reliability.

The memory map is not given in the manual though addresses are given for the screen and various control registers. Overall there is a total of 54k of RAM which is available to the user though 16k of this is in parallel with the Basic interpreter so from Basic only 38k is left. There is 4k of ROM on top of Basic and 3k of system RAM. Unlike the Z80 and its relatives all input/output ports will appear on the main memory map so a true 64k is difficult to achieve on 6502/6510 machines.

Graphics

The graphics capabilities of the Commodore 64 are quite extensive. They represent a reasonable compromise between the speed and economy of memory of graphics characters against the convenience and quality of true bit-mapped high resolution graphics with its demands on memory.

There are three ways of using the 64's graphics. The first is by the graphics characters available from the keyboard and through the CHR\$ function; all graphics characters as well as control characters can be entered between quotes in a Basic string assignment. This makes it quick and easy to program many static pictures, such as Bar charts for example. The second way is to use POKES to play around in the video registers to give a 320 by 200 pixel resolution; this is not very easy or convenient but may be made

easier with "Simon's Basic".

The third and most interesting technique is the sprite graphics where high resolution shapes can be plotted on a 24 by 21 grid and can be made to move around the screen, enlarge and diminish through values POKEd into various sprite registers. They can be made to pass behind one another and collisions can be detected. Up to eight sprites can be active at any one time. Once again the process of defining and manipulating sprites is quite complicated from the standard Basic. The sequence that must be followed to define and use a simple sprite is first to plot the required shape on a 24 across by 21 down grid using graph paper. Each row of 24 on/off bits is interpreted as 3 bytes and the resulting 63 8-bit binary numbers converted to decimal. These 63 data values are transferred to a block of 63 bytes somewhere at the beginning of memory - the number of this block (in multiples of 63 from 0) must be POKEd to a particular register so that the sprite knows where to get its data. The starting address of the video registers is at 53248 and the number of the register is added to this base address to get the address of the register into which the appropriate values can be set.

Motion is achieved by updating the X and Y co-ordinates. The user must be able to convert between one or more '1's in an 8-bit binary pattern representing one or more sprites being manipulated into a decimal number. Collisions can be detected by PEEKing at registers and determining whether or not particular bits have been set. Sprites can be any of the 16 colours or a special multi-coloured one. One problem arises with the use of an 8-bit register to hold the X co-ordinate since this gives a maximum value of 255, whereas the screen width is 320. To move past the barrier needs the setting of the Most Significant Bit for the appropriate sprite in register 16, which effectively makes the X co-ordinate into a 9-bit number and hence up to 511. The sprites are not particularly fast when used from interpreted Basic but speed should increase when compiled Basic or Assembly code is used to give some good games effects.

The normal characters can be POKEd into the screen, which occupies 1000 bytes from 1024 in a straightforward row by row one byte per character grid, but the character codes to be POKEd are not ASCII. A parallel 1000 bytes starting at 55296 controls the colour in each character position which can be again be set by POKeing the appropriate colour code into the correct place.

Sound

The sound generation facilities are another strong feature of the Commodore 64. Again the standard Basic leaves you to set all the various features of a sound by POKeing into various registers but the facilities are excellent and the quality good.

The first thing to note is that the sound actually comes from the television set;

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COMMODORE 64

there is no in-built loudspeaker. An audio output is available from the same connector as the video output and enables the sound to be played through an amplifier or a domestic hi-fi. It has been claimed that the sound produced by this machine is as good as some synthesisers, I think this is overstated but the quality is as good as I have heard and the range of settings available is quite staggering.

There are three voices occupying a range of registers from 54272 to 54292 inclusive. It is possible to control for each of three voices: volume (a range of 0-15), attack/decay and sustain/release, frequency, waveform, and pulse rate. Values are given in the manual to play notes over 9 octaves and in a variety of voices ranging from piano to trumpet as well as suggestions for found effects. A piano keyboard is one of the add-on units that should be available soon and that could be interesting if backed up with suitable software.

Documentation

The Commodore 64 comes with just the one 'User's' manual which purports as usual to be both a manual for the machine and an introduction to Basic (and binary arithmetic in this case). It does not really succeed but it could be worse. On balance it is much better than many Commodore manuals in the past. My main criticism is

its small size: the reader is pointed towards the 'Programmer's Reference Manual' for further information but this has to be obtained separately. There are some major omissions from the 'User's Manual', notably the only mention of the function keys is to point out how useful they could be, but nowhere does it mention how to use them! I would think that the 'Programmer's Manual' was necessary enough to warrant inclusion as standard.

To emphasise the dual nature of the Commodore 64 the manual seems to assume that many users will be attaching a disk drive so all instructions for loading and saving programs, and for the use of data files, duplicate for disks and tape.

The manual gives a number of useful examples to illustrate the use of Basic and the various facilities of the machine. Tables are included in the appendices for the video control and sound registers and clear instructions on how to POKE to the screen and the screen colour area.

Although it is quite well written the manual does seem to fall between two stools; the novice may well find some of the tables and the binary arithmetic a bit daunting and require something which takes a bit more time over their use. On the other hand a more experienced user would feel a bit restricted by the absence of the Programmer's Manual and so would need to buy it straight away.

Conclusions

The Commodore 64 is what you might

expect from a major manufacturer like Commodore: a professional high quality machine with a guaranteed large software base. There is nothing startlingly new about this machine, in some ways it is a marketing ploy like the new Apple IIe: upgrading a well-tried and proven architecture with the most modern technology. This allows the manufacturer to launch a product which will compete on equal terms with the new machines while armed with peripheral attachments and software already available. That has to be a recipe for success. The VIC printer, joysticks, disk drives and others will all work on the 64, new sophisticated additions designed for this machine will be available shortly.

The machine is already proving very popular in America, and Europe has always been a better market for Commodore than for the company's major competitors so there is no doubt whatsoever that the 64 will sell well and have a major effect on the market.

It is a good machine with all the facilities that a home user would require, although I have my doubts as to its useability as a business system, but this will depend very much on the software. There are machines around now or coming soon which will overtake the Commodore 64 in specification but the 64 will have the same advantage that the VIC enjoys, namely that it along with its peripherals and software will be available in large numbers on every high street.

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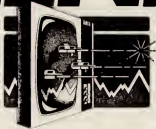
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SCREENPLAY

Steve Mann selects his



favourite Spectrum games.

Regular readers of this column will notice that there is a new name in the headline this month. There is also a considerable increase in the marks given for each game. This does not mean that I am by temperament more generous, more forgiving, sweeter-natured than Dick Olney — although this is undeniably the case — but on this occasion various factors have combined to make this review something of a special case.

When Dick was in charge of this column, he would follow a set pattern; first borrowing a machine from the relevant manufacturer, then selecting the software from among the games that are sent in for us to review. In certain cases, particularly when the machine in question was very new and little software was available, he would arrange to borrow a selection from a friendly micro retailer. This is the procedure I will be following in future months. However, this time out I am looking at software for the Spectrum — a machine I have spent a good part of the last 10 months getting to know and love. As a consequence, I

have accumulated a mass of software, and from this I have selected my favourite games.

The Spectrum situation has improved immeasurably since Dick first took a look at games for this high-selling machine; he was justifiably acerbic in his comments about some of the software that was then available — most notably the ICL range marketed under the Sinclair banner. Most Spectrum software at the time was ZX81-based, hastily updated with a few colour commands and BEEP statements, and, almost without exception, failed to do the machine's capabilities justice. Six months later, however, things have improved beyond recognition.

Sinclair machines spawn a vast number of spin-offs — the number of people who make a living producing goods solely for Clive's products must be in the thousands.

The advantages are obvious — there's a huge captive audience, and the very nature of Sinclair freaks seems to encourage the 'cottage industry' approach. This means there's lots of competition and, as a consequence, prices are kept low and choice high. For the user, this is an ideal situation — if he wants a Spectrum version of Star Trek or Scramble, he's got a choice of sometimes dozens, and it's very unlikely he'll have to pay more than five or six quid.

The games on offer here, then, are not especially new; they are all programs that I've spent a fair bit of time with. They are all professionally produced (but note my later comments on spelling and grammar), imaginative packages that are in no way inferior to some that run on the BBC or Atari — and which will cost probably three times as much. The 'Value for money' rating this month is, therefore, largely superfluous. All the games I look at here I would recommend unhesitatingly as being superb value... Note that, with the exception of Arcadia, all games reviewed here require the 48k Spectrum.



Game: Football Manager
Supplier: Addictive Games
Price: £5.95

Never was a company more aptly named — at least, if this particular piece of software is representative of the rest of Addictive's output... when I first received this game I spent the best part of a weekend playing it, and since then have returned to it more often than any other in my collection.

The object of the game is to pilot your chosen team from Division 4 through to the League Championship, on the way winning the FA Cup as often as possible. The game mirrors reality in that a good Cup run will give you greater attendances, hence more money at the gate; conversely, losing too many games cuts your income and can result in you getting the sack. You have a maximum of 16 players in your squad and can buy or sell as the situation dictates, borrowing from

the bank as necessary. You can change players' names to suit your own foibles and prejudices — which is just as well, as there's no way I'd have Kevin Keegan in any team of mine — but unfortunately your players must have names of eight letters or less, including initial, so there's no room for Kenny Dalglish. There's nothing to stop you changing a player's name to your own and leading your team to glory from the field!

On loading Football Manager for the first time you are invited to enter your name, and then choose a team from the 64 on offer. No matter which team you choose, you start the game in Division 4 — which must be particularly galling for Liverpool fans. If your favourite team is not represented, you can select any of the others and then change the name. You then select your skill level from a choice of seven, ranging from beginner to Genius. It is recommended that you start as a Beginner and increase the difficulty as you become more familiar with the game — managers of genius quality seem to suffer from an inordinate number of injuries to their players. You then have to choose your team's colours — this is not too realistic as you are restricted to black or white — and the game begins.

The truly addictive quality of this game is the remarkable way it mirrors a real football manager's problems. Each player in your squad is rated between 1 and 5 in skill; this rating affects his price in the transfer market and his cost to you

in wages. In addition, each has an energy value of 20 or less; each game played reduces this value by one, while resting the player for one game boosts his energy by 10. Your team's performance will depend on values obtained from the skill and energy ratings of the players selected, plus a morale factor — lose games and this goes down, making you more likely to lose again. This is identical to a real team's performance — teams that start losing tend to make a habit of it.

So far, the whole game is purely textual — but now the fun begins! Having selected the most suitable team for the forthcoming game (you have a dossier on your opponents' skills, morale and energy) you have to sit back, biting your nails like any real manager, while the game is played. This is done in a series of goalmouth scrambles — there's a real thrill in seeing your forwards converge on the opposing goal and a sense of uncertainty as to whether the defence clears it or the ball hits the net. Successful shots are greeted by an electronic scoreboard flashing 'GOAL!' and the match score is displayed.





It should be stressed that this is not a short game — there are 15 games in a season, plus the various rounds in the FA Cup — and to get from Division 4 to the League Championship at any of the higher skill levels is going to take you a week or two of playing every day. However, having taken Aldershot FC

SCREENPLAY

from the lower reaches of the fourth division to the top of the first, winning the FA Cup every year along the way (admittedly, only on Level 2), I can vouch for the satisfaction that can be gained from this program. Recommended

to anyone who has any interest in football — but I suspect non-sportspersons (is this non-sexist enough to get past the typesetter?) (*I'd recognise Garth Crook's bodyswerves anywhere — enthralled typesetter*) would find it somewhat

incomprehensible.

Presentation: 
Additive quality: 
Use of graphics: 
Value for money: 



Game: Flight Simulation
Supplier: Psion/Sinclair
Price: £7.95

This program is based on a ZX81 flight simulation, but the enhancements are substantial enough to treat it as a new product in its own right.

You are presented with the view from the cockpit of a small, high-performance, twin-engined plane; the screen is split in two, with the instrumentation in the lower half and the outside world visible through the cockpit window at the top. Pressing 'm' gives you a map of the flight area, showing the two airports — 'Main' and 'Club' — a range of hills and three lakes, as well as the seven radio beacons that you lock onto for navigation.





On first attempting the simulation, the

user will probably find the instrumentation somewhat confusing — it is all too easy to go into an uncontrollable spin and plunge into the ground at a high rate of knots. But after a while you develop a sufficiently light touch on the controls. The instrumentation consists of an airspeed indicator, fuel gauge, power gauge to measure engine thrust, a digital panel which tells you which beacon you're locked onto, how far away it is and its bearing in compass degrees relative to the plane, warning signs to tell you if flaps and landing gear are up or down, a radio altimeter which gives an exact read-out of heights under 1000 feet, and the large RDF clock, which shows a diagrammatic representation of an aircraft in the centre with a digital read-out of your heading and a blip that moves around the clock's circumference and helps you align your craft correctly. Finally there's the ILS (Instrument Landing System) dial; this makes sure you are correctly lined up on the runway as you make your approach. By the time you've got this far, you'll be able to see the runway through the cockpit window; as soon as the radio altimeter hits zero, throttle back and — in theory, at least — you should take smoothly to a halt. To help in taxiing, there are two rudder controls; these also have some effect in

flight, although I tend to ignore them unless I'm on the ground.

As you can see, there's a lot to keep track of, and to date I have managed only a couple of complete flights — which ended with the message 'That was a bouncy landing!'. You have the option of starting from take-off, from level flight, or from the beginning or the final approach — and if you're feeling flash you can add wind effects to make things even more difficult.

It's a piece of software that you'll return to time after time — it may not match up to the IBM simulator, about which the whole world and his uncle is currently raving, but given the limitations of the Spectrum it does a fine job. It should go a long way towards restoring the somewhat tarnished image of Sinclair-label software — though I largely absolve Psion from any previous derogatory comments, as its products have always been at the very least adequate. This is considerably more than adequate; in fact, 'excellent' is the word that springs to mind.

Presentation: 
Additive quality: 
Use of graphics: 
Value for money: 



Game: Time Gate
Supplier: Quicksilver
Price: £6.95

Time Gate is heralded as a '4D Arcade Adventure' — the fourth dimension being time. You inhabit a galaxy almost totally dominated by the Squarm — a race of 'vicious insectoid reptiles'. Mankind clings precariously to existence in the solar system. There is one functioning time-ship available — your task is to take this vessel and travel through the galaxy, going backward in time through randomly placed 'time gates' until you can reach the Squarm's home planet and destroy them before they breed and start

their loathsome galactic domination.

The program is in two parts. Part 1 describes your mission and explains the ship's controls. Quicksilver and program writer John Hollis have taken the trouble to redefine the Spectrum character set completely, but spoil it with silly mistakes — they use no apostrophes at all, and on the very first page misspell 'possible' as 'possable' — which somewhat spoils the effect. It may be unfair, but I find things like this prejudice me against the game.

Anyway, climbing off the hobby-horse and returning to Time Gate... The on-screen manual takes you step by step through the ship's instrumentation and explains all this clearly. You have a map of the galaxy which show your position and tells you which galactic sectors contain Squarm or planets where you can land and refuel. There's a message screen to display information from the ship's computer and a target computer which locks onto the nearest alien craft in the sector. On this panel there are also six coloured segments to give information on the extent of damage suffered by your craft's various support systems.

You play the game by moving,

Star Trek-style, through the various sectors of the galaxy. Time Gates are not displayed, but your instruments will detect them if they occur in a sector you have cleared of the enemy. The computer navigates you through a Time Gate and gives you a new date, going ever backwards towards Year Zero. You can refuel and repair your ship by landing on a planet in an enemy-free sector — but once you've taken off again the planet blows up, which seems a little harsh on its inhabitants.

Once you've digested the instructions, the main game loads. There's a keyboard overlay to mark the relevant keys — very useful — and a hold button so you don't lose your place if the phone rings. The game is similar to Star Trek in the searching out of the enemy, but the action is real-time, with enemy craft swooping around your cockpit. Visuals are very effective for landing and taking off and the game is undoubtedly the product of a lot of hard work. Unfortunately I found that by the time I zapped my twentieth alien I was getting seriously bored — it all seems to go on a bit too long. You can abort the mission at any time, in which case you are given a points score

— but I can't work out how this is calculated.

Full marks for design, then (if not for spelling), but I'm not convinced that this

is a game to return to very often. I'm glad I've tried it, but it won't break my heart if I never play it again.

Presentation: ☐☐☐☐☐☐☐☐
Addictive quality: ☐☐☐☐☐☐☐☐
Use of graphics: ☐☐☐☐☐☐☐☐
Value for money: ☐☐☐☐☐☐☐☐



Game: Arcadia
Supplier: Imagine
Price: £5.50

Now this really is something special... The bright young things at Imagine have confidently pledged themselves to the production of totally original arcade-style software for a variety of home machines — no Pac-Man rip-offs here — and I would guess that Bug-Byte (probably Imagine's closest competitor) is feeling decidedly sick at the success of Imagine's first batch of product.

First impressions of Arcadia are of a high degree of professionalism. The colourful cassette insert credits the game and graphics designers (take a bow D Lawson and M Butler), and Arcadia offers a lifetime guarantee — if one of

their games ever fails to load for any reason it will be replaced at once, totally free of charge. This is certainly a step to be encouraged. Instructions for setting up are clear and concise, and there's a touch of sly humour in that the alien beasts you are battling against belong to the Atari-an Empire. Of course, it could just be coincidence...

The object of the game is fairly standard zap-the-alien stuff; the alien fleets attack in waves, and there is a timer at the top of the screen. If you manage to destroy a whole fleet before the timer reaches zero, another replaces it. Conversely, if the fleet fails to destroy your ship (the Arcadia) within this time limit, it will break off the attack and a new race will home in on you.

The player has a wide choice of control keys, so it is easy to configure the keyboard to suit your particular finger-span. There is also a 'freeze' facility — any key on the top row halts execution, enabling you to break off and go and make a cup of tea.

Arcadia is very deceptive in the early stages. On playing the game for the first time it is highly unlikely you'll get past the first stage of fairly ordinary-looking alien ships. But as you get better you begin to appreciate the truly stunning graphics — there are 12 different waves

of attackers: mutant butterflies, birds, strange spinning circles, octopus-type shapes, even a mini-Centipede game at one point. If you manage to get through four levels intact, you get an extra ship (you start with five) and I am informed that there is someone out there who has reached the 53rd level; a claim I find hard to believe as the Atarian Empire is certainly no soft touch. Luckily for us cack-handed reviewers, Imagine sensibly sent along a special idiot's version of the game, which gives 99 lives instead of five — even with this enormous advantage I find I'm hard-pushed to keep up with the speed of the game. Part of the trouble is the tendency to sit back and gawp at the beauty of some of the creatures attacking you; this cassette really does show that, given sufficient imagination (sorry!), Spectrum graphics can match up to almost any other machine around.

I understand that Arcadia is now one of the top-selling Spectrum games on the market — all I can say is that it thoroughly deserves its success. Only reason it doesn't get even higher marks is that Imagine staff are big-headed enough anyway...

Presentation: ☐☐☐☐☐☐☐☐
Addictive quality: ☐☐☐☐☐☐☐☐
Use of graphics: ☐☐☐☐☐☐☐☐
Value for money: ☐☐☐☐☐☐☐☐



Game: The Hobbit
Supplier: Melbourne House/Sinclair
Price: £14.95

A new Melbourne House offering — and this is the one everyone's talking about. Based on the Tolkien saga, this is an adventure in which you take on the role of Bilbo and seek out the evil dragon, taking his hoarded treasure and returning it to the chest in your home. You have the added responsibility of looking after Thorin, whose survival is supposedly vital to your quest; I must admit, however, that I tend to kill him off as quickly as possible — his major activities appear to consist of telling you to hurry up and sitting down singing about gold at

every opportunity. This is a major feature of the Hobbit — described as 'animation' in the manual, what it really means is that the characters interact with each other. Even if you're merely passively waiting at a location you just know that they're off somewhere huddled in a corner, plotting...

This adventure has a vocabulary of over 500 words, and it is possible to chain commands in the form of, say, 'Take the axe and go through the door and kill Thorin'. You start in Bilbo's hobbit-hole, where you are visited by Gandalf the magician, who gives you a map, and away you go... as you'd expect there are trolls to avoid or kill, treasure to amass, etc, and in many ways it is a typical adventure.

But The Hobbit has two important differences — there are very good graphic representations of many of the locations, and there is 'English'. English is the language you use to commune with the computer. This is very sophisticated — as a bare minimum a single verb or even a compass point can be entered, but at the other end of the scale the program can cope with chained commands of the kind described above. Adverbs and adjectives can be very important and punctuation is

used in its normal form. The only limitation is length — no more than 128 characters. This allows you to be very specific — 'break all the bottles except the green one' — and it really does give the impression of holding a conversation with the computer.

Melbourne House has made moving around very easy; let's assume you're in Bilbo's house when Gandalf opens the door and goes eastward. If you want to follow him, you have a multitude of choices. If you only want to go in one of the four major compass directions, you simply press the relevant cursor key (no need to use Shift). Alternatively, you can specify movement in any direction either by spelling it out in full, abbreviating it, or using it as part of a sentence. If you know the name of the location you're heading for you can just say 'Enter Lonelands'; alternatively you can specify 'Follow Gandalf'.

This first time you reach a location the computer gives you a full description of where you are and what the place looks like, plus a list of visible exits. If you return, the description is shorter but you only have to ask and you're given a complete run-down. You can ask for help at any time, but the results are often some-





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what puzzling. On finding myself in a dark place, where I kept falling over and banging my head, I tried seeking the program's aid. Asking for help elicited the information that 'A window should be no obstacle to a thief with friends'!

The cassette comes in a large box containing a comprehensive 16-page instruc-

tion booklet and a copy of the Tolkien book. The Hobbit was written by Philip Mitchel, Veronika Megler, Alfred Milgrom and Stuart Ritchie and they, and Melbourne House, deserve a great deal of credit. I can fault it only on cost — £14.95 — but this just illustrates how well off Spectrum owners are. An Atari

user would consider that sum cheap for a good piece of software — and, after all, you do get a book thrown in for good measure.

Presentation: 
Addictive quality: 
Use of graphics: 
Value for money: 



Game: Penetrator
Supplier: Melbourne House/Sinclair
Price: £5.95

Not another Scramble variant (yawn. . .). But I suppose every home should have one, and it must be admitted that as Scramble versions go this one goes a long way. Melbourne House is fast gaining a reputation for classy products, and this is no exception.

I'm sure you're all familiar with the object of this exercise — you pilot your craft over hills and through tortuous caves, dodging missiles and avoiding rocky outcrops until eventually you reach





a nuclear bomb store which has to be destroyed. To add to the hazards, there's a network of radar stations to keep tabs on your flight path — if you don't knock 'em out the missiles get more accurate and your chances of survival — slim enough at the best of times — diminish accordingly.

Written by Philip Mitchel (who also had a hand in The Hobbit), this game is as near as damnit impossible. The player is given every possible aid to success — there is a special training mode which allows practice of each stage independently and, more importantly (in my case at least), there's a landscape editor which allows you to customise the game to your own specifications. By reducing the number of missiles by 75 percent I managed to reach the neutron bomb store — but even after destroying this you still have to get back out again, and it sure isn't easy. I suspect it will take weeks of practice to get good enough to negotiate the whole game. I suggest designing three or four landscapes, each containing progressively more missiles (these can be saved on tape for later reloading) and trying to work your way up to completing

the whole scenario.

It takes a little while to get the feel of the controls — up and down movement is handled by the 'q' and 'a' keys and thrust and brake are available for limited periods only via the 'p' and 'o' keys. The 'p' key also doubles as a firing button for launching forward missiles — this is the bit that needs care; firing involves repeated pressing of the key and it is very easy to press too slowly, with the result that instead of obliterating your target you fly headlong into it. Any key on the bottom row activates the bomb launcher.

Penetrator is unique in its customisation feature and will astound those who like to sneer at arcade-style games played on home computers. Just load the cassette and ignore the menu of choices at the beginning: after 30 seconds or so the program will play a demonstration game. It always scores 13,000 or so, and never gets as far as the neutron bomb store, but it's fascinating to watch.

Presentation: 
Addictive quality: 
Use of graphics: 
Value for money: 



Game: Pimania
Supplier: Automata Software
Price: £10

I'm not too sure that Christian Penfold and Mel Croucher should be allowed to walk the streets; both of them are obviously warped. . .

Pimania is a game that defies description, but I guess I'll have to give it a try.

What we have here is a world where saxophones turn into hang-gliders, where red herrings swim across the bottom of the screen blowing bubbles of derision, and where snatches of music confuse, hinder and occasionally help you. Along the way you'll be greeted by a blatant appeal for cash — they promise to send

you a t-shirt, but what makes you think you can trust them? Throughout your adventures you'll be involved with the Pi-Man who'll give you presents of useful things like blackboards then next minute rob you blind.





It's a game that encourages all that is noble in the human spirit — namely naked, ravening greed. The prize is a specially designed £6000 gold and diamond sundial; whoever wins it will certainly deserve it but will undoubtedly be a gibbering lunatic by then. A couple of hours spent with this game is enough to induce dementia in the most stable of personalities — I'm having doubts about my sanity even writing about the damned thing.

Seeing as there's so much at stake, I'm not going to tell you too much — why should I help you get rich? Suffice it to say that it's an adventure, but the objects are not your run of the mill swords, magic rings and potions — oh no, here you get to pick up TV dinners, cans of worms, handfuls of valium. . .

The object is to get through the Gate of Pi, which will reward you with a place name and date. Turn up here at the appointed time and an Automata person will be there to hand over the goodies.

There are potential clues in everything — probably even in the horrendous 'disco single' on the other side of the program tape. This is 'performed' by Clair Sinclair and the Pi-Men, with instrumentation provided by the Spectrum and a Casio VC-1. I'm sure this is vitally important, but it's much too awful to listen to.

All I can say is that the Pi-Man does a mean hokey-cokey, the animation makes nonsense of the fact that the Spectrum is a slow computer, and the cassette case should carry a Government Health Warning: this game can damage your brain. Try it — you'll love it! It would appear that Automata staff are not expecting an early winner — if no one shows up on the first date set they promise to return at the same time on the same day of every year until the prize is won. You will also find yourself in competition with owners of various other machines — there are versions for the Dragon, the ZX81 and the BBC.

Presentation: 
Addictive quality: 
Use of graphics: 
Value for money: 

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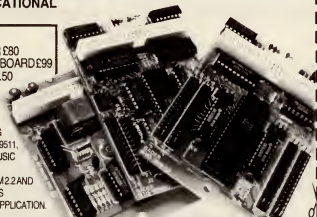
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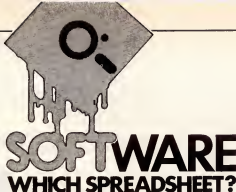
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PLANNERCALC

Mike Liardet brings us the fourth article in his continuing series of everyday spreadsheet systems.

The use of 'calc' and 'plan' in spreadsheet names is currently very much in vogue, and Comshare has scored a uniquely imaginative first by giving us both in one name.

Plannercalc is one of two spreadsheet systems it is currently selling or, perhaps more accurately, giving away — the price is only £39 plus VAT. Comshare's other spreadsheet system, Masterplan, is more sophisticated (and expensive — £245 plus VAT) and is claimed to be fully compatible with Plannercalc. In this article we shall look the gift horse in the mouth; we will consider only Plannercalc, and postpone Masterplan until much later in the series — unless of course *PCW*'s switchboard gets jammed by the clamour of requests to the contrary!

Comshare is a multinational company with offices throughout Europe, the US, etc. It has a lengthy track record as a time-sharing bureau and one of its specialities is in the area of financial planning. Clearly, Comshare was heavily involved in this area long before the spreadsheet was even a twinkle in the eye of its originators, Bricklin and Frankson.

Now as all/both avid readers of this series will know, one of the prime (but not the only) uses for spreadsheet systems is in the area of financial planning/modelling. Doubtless many former time-sharing users have migrated on to the more cost-effective micro and so one doesn't need to be a clairvoyant to divine the reasons for Comshare's diversification in this direction.

Apart from the above credentials, Comshare can also claim to have brought on our TV screens no lesser a personage than Ian McNaught-Davis, head of Comshare UK and also the erudite presenter on the BBC's 'Making the most of the micro' series. By one of those strange coincidences beloved by software reviewers everywhere the episode immediately prior to my writing this review (in mid-February) consisted of a short exposition from Ian McNaught-Davis on spreadsheets (no, he didn't plug

Plannercalc) followed by an interview with a consultant on the subject of tips for purchasing software packages.

Does Plannercalc match up to Mac's own excellent standard of presentation? Does it meet the exacting standards outlined by the consultant? Well, why wait in suspense for the answer? 'No, it doesn't.' Now read on to see where and why it fails.

Documentation

Alarm bells started to ring at the very first page of the manual: a short list of Plannercalc's major features (including 'quality assurance' — more on this later), followed by: 'COMSHARE. . . when time and money are not expendable, you can afford nothing less than the best'. After re-reading this several times, mentally cancelling the double negatives, realising that the poor print quality had caused me to mis-read 'expendable' where it actually says 'expendable' etc, I eventually worked out that this was actually, as one might expect, a positive statement for Comshare's services! I am not sure if the *Guinness Book of Records* has a 'Worst Slogan' section but I am sure this should be a candidate for it.

Thumbing further through the manual reveals a fairly substantial amount of documentation, about 100 pages in all, but a fairly mediocre print-quality, interspersed with occasional typographical errors (eg, 'excessive', 'in tact', 'hierarchy'), and self-congratulatory text (eg, 'A great advantage Comshare Software has over. . .') — which would be better omitted from the manual and left to the advertisements. The type size is approximately the same as that used in this article but the lines are closer together and the overall effect is that of a photocopied reproduction rather than an original. Generally my young eyes (well, relatively young anyway) managed to cope with this, but long-sighted users could find it rather a strain.

The manual is held in a ring-binder with a pouch at the front for the disks.

There is provision for opening the binder in a special way, so that it can stand freely as if it were on a bookrest. Bookrests seem to be all the rage with software manufacturers at the moment — it's a pity that my desk is always too cluttered and I have to simply sit with the manual on my knee. (When are we going to get binders that convert into fridges, tyre levers or something I can use?)

Anyway, in this ring-binder the rings are slightly too small and the pages get snagged as you are turning them. This seems to be a common fault with ring-binders, but is especially irritating in this case, as page-turning is an all too frequent activity when using Plannercalc — it's very difficult to find your way round the manual. 'Doesn't it have an index then?' I hear you say. Well, yes it does, but occasional inaccuracies coupled with unintuitive entries make life unnecessarily hard. (For example, the index entry for 'Copy' includes page 8-13, which didn't exist in my manual. Information on wiping clear the current spreadsheet cannot be traced by 'Clear', 'Wipeout', 'Zap', etc, but is actually listed under 'Create'.)

I could list further inadequacies in the manual, but you should, by now, have got the drift. In conclusion, though, is there anything good to be said about it? Well, it is fairly substantial, occasionally illustrated, has a nice glossary and all the information you are likely to need can be found and deciphered eventually — you just have to work quite hard at it!

Getting started

My review copy of Plannercalc arrived as two 5¼ inch disks for the Apple II CP/M system. It is in fact available in a wide variety of disk formats, with facilities for the purchaser to configure it for most 80-column VDUs. It will run on CP/M systems only, unlike its big brother, Masterplan, which also runs on CP/M-86 and MS-DOS.

The manual gives some instruction on how to set up working disks — a fairly brave attempt, as primarily this involves

using CP/M programs supplied by individual computer manufacturers, which are of course full of their own idiosyncrasies. Once the working disks have been made, the originals can be carefully locked away and the computer switched on or booted as normal, with the newly created working disks in place.

The next step is to 'install' (ie, modify) the program for your own particular VDU. You do this by running a program called, you guessed it, 'INSTALL'. The first response to this program requires some thought: 'Which Target program are you using?' The Appendix on 'INSTALL' provides no information on this whatsoever. I subsequently discovered the information on this elsewhere; it transpires that 'PCOLY.TGX' is the required response. ('TARGET', by the way, would appear to be the software house or Comshare subsidiary that developed Planncalc.)

Once past this hurdle, matters become a little simpler. If you are lucky, your own VDU will be listed on a preliminary menu and all you will need to do is to make the right selection to finish the installation. Otherwise facilities exist to set up manually the information for your own VDU. This is always a painful process for any package, involving a lot of jargon and much thumbing of your VDU manual. Try and exercise some charm on your dealer and get him to do it for you! (You'll need plenty of it — at £39 retail price, he has no great margin for user training.)

Having got this far, you are at last ready to use Planncalc — simply enter 'PC' in response to the CP/M prompt. By reading between the lines and examining the directory of all files provided with Planncalc it is possible to deduce that 'PC' behaves like a command file, doing little more than reading in the files which actually do the 'work': 'PCOLY.TGX' — presumably a mnemonic for Planncalc Overlay — 'PCHLP.TGX' and 'PCERR.TGX' being the files containing the text of 'help' and error messages. I mention this here, since the manual doesn't (or at least couldn't be found to, which amounts to the same thing), and I spent some considerable time discovering that all these files need to be together on the same disk for the system to be fully operational.

Planncalc v Visicalc

Comshare's experience of a decade or more with financial planning has had a considerable influence on the design of this system. Unlike some manufacturers, who have simply come up with a revamped Visicalc, Comshare obviously has its own ideas of what the public wants. Planncalc uses the spreadsheet approach pioneered by Visicalc, but there the resemblance ends. Instead of formulae which operate only on individual specified cells in the spreadsheet, Planncalc's formulae operate on whole rows at a time. Not only that, but if the rows are 'named' the

names can be used in formulae, eg, 'LINE 10 PROFIT=SALES-COSTS'.

This sort of approach is obviously appealing in financial applications, but is attained only at the loss of some flexibility. For example, setting up the Benchmarks proved to be much more tricky with Planncalc than with other spreadsheet systems. For the financial planner there is unlikely to be any problem, but other spreadsheet users, particularly those with technical or scientific applications, are likely to find Planncalc a little bit frustrating. Comshare would appear (indirectly) to acknowledge this fact: the product is clearly labelled with 'Business Planning on a Micro'.

If I may borrow an analogy from the field of programming languages: Planncalc is like Cobol on a spreadsheet whereas Visicalc is like Basic. This analogy extends also to the famed verbosity of Cobol — many Planncalc formulae involve fairly lengthy typing, but tend to be more readily comprehended when reading them back afterwards.

Using Planncalc

Having described the basic design innovations in Planncalc, we shall move on to what it is actually like at the keyboard. Earlier on, we left off just after we had entered 'PC' to run it. After a preliminary 'copyright screen' we arrive at the spreadsheet display. Basically this consists of status information (memory space left, etc), a prompt line, a portion of the spreadsheet itself and an input line for entering formulae.

Typing 'DIRECTORY' gives a list of all models on the disk. Immediately following this, the system pauses until the Escape key is pressed. No indication is given on the screen that this key should be used and it is also difficult to track down this fact in the manual, so the immediate impression is that the system has crashed. Anyway, once we can see the models available (Planncalc is supplied with some demonstration models) we can quickly load them from the disk using the 'RECALL' command.

Once we have a model loaded into the spreadsheet we may wish to explore it. Like most spreadsheet systems, Planncalc provides the usual cursor move with windowing described in earlier articles. First it is necessary to press the 'execute' key, as the manual describes it. This key is defined by the installation procedure and varies for different VDUs. Eventually we track down the vital information, 'E' (ie, a two-key hit using 'control' and 'E' keys simultaneously) is 'execute', on the Apple at any rate.

Cursor moves are achieved with AT, AV, AF, AG for up, down, left and right. If you have a keyboard nearby you can verify that these keys are arranged as four points of the compass, and their position relative to one another readily indicates their function. My only criticism of this choice of keys is that they are a little far from the 'control' key, and you need a finger span approaching that of a piano-player to be

able to do cursor moves with one hand.

It was obviously the intention of the producers of this system that attempts to move the cursor outside the confines of the present model would be signalled by a beep at the VDU. Unfortunately this did not happen consistently. Moving to the left of the first column elicited the correct response, but moving into the last column caused a beep. Attempts to move above the first row or below the last row produced no audible warning at all. In no cases did the system crash or do anything drastic, but the inconsistency was mildly disturbing.

It should be noted that, although it is possible to move the cursor freely around the spreadsheet, the only point in doing this is to examine different parts of it. There are no facilities for modifying the current cursor cell, as there are with Visicalc, for instance.

Modifying cells, or entering data and formulae, is achieved by using commands. The first command needed is the 'SIZE' command — you use this to specify the number of columns you will need in your model (eg, 'SIZE=13' if you want 12 months and one total column). You do not need to pre-specify the number of rows. You can also adjust the display characteristics by modifying column widths, etc.

Now for some examples of entering data and formulae:

```
LINE 4 WAGE/RATE = GROW 4  
BY 8%
```

This sets the row heading for the fourth line to 'WAGE/RATE', enters a 4 in the first column, $4.32 (= 4 * 1.08)$ in the second column, $4.67 (= 4.32 * 1.08)$ in the third, and so on.

```
LINE 5 EXPENSES=  
.* (WAGE/RATE + 200)
```

This sets the row heading for the fifth line to 'EXPENSES', enters 102 ($= .5 * (4 + 200)$) in the first column, 102.16 ($= .5 * (4.32 + 200)$) in the second, etc.

It can be seen from the above examples that Planncalc is vastly different from, say, Visicalc in the way that the model is set up. It would seem to be particularly easy to use for financial planning — the user does not have to wrestle with the intricacies of replication, etc — but, because the operations are predominantly designed for row upon row operations, setting up models with a more complex mathematical structure can be made more difficult. It should also be noted that text can be entered only as row or column headings and cannot be freely entered at any place in the spreadsheet, as with many other spreadsheet systems.

Other commands

We have already seen that Planncalc commands are used for setting up the model (eg, the 'LINE' command used in the above examples) and for controlling interactions with the disk (eg, 'DIRECTORY', 'RECALL'). Other commands permit printing, clearing the spreadsheet and so on.

SoSoft

SOME EXISTING

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One of the difficulties with using the system is that some of these commands are badly named. For example, after selecting 'PRINT' and having completed a printout we wish to return back to the normal display and continue working with the model. The screen gives no indication of how to do this. There is no quick reference card. So it's back to that manual! Eventually it transpires that we should enter 'RESULTS' to finish with printing — fairly cryptic. (Incidentally other aspects of the print facility are quite good — for example automatic formatting for reports too wide for the paper.)

Another misnomer is 'CREATE' — this actually does the opposite (ie, annihilate). In fact the best named commands are those that enable you to exit from the system and return to CP/M. The implementors have obviously put a great deal of thought into these, and have provided no fewer than five ('FINISH', 'QUIT', 'BYE', 'END' and 'STOP'), all of which have exactly the same effect! This is reminiscent of the old joke: 'The only good thing about town x is the railway station out of it.'

Conclusion

When assessing Plannercalc it is impossible to ignore the price. It is obviously going to appeal to people on a tight budget as the system is as rich in features and facilities as many of the more expensive spreadsheet systems. But, in my opinion, due to poor documentation, badly worded screen prompts and unnecessary jargon, a user is going to take a lot longer to become proficient with Plannercalc and he must count the cost of this in his considerations.

Naturally, the low price is a poor incentive for dealers to provide anything more than 'take it or leave it' support. (After all, the price is almost in the Space Invaders category.) If you have an established relationship with a dealer then you may fare better than this; likewise if you are also simultaneously buying all the hardware to run it. In the latter case the savings pale into insignificance alongside the overall bill, anyway.

Oddly enough, if you shift your attention away from the cost considerations (which Comshare doesn't — these features prominently in all its advertisements), Plannercalc does actually have some interesting features and facilities not generally available on other spreadsheet systems. These include English-style commands and compatibility with Comshare's more sophisticated Masterplaner. If you buy it because you want this compatibility, rather than because you want to save a few quid, you will be far more likely to find long-term justification in the purchase.

Checklist

Documentation: Terrible

User-Friendliness: A useful 'help' facility, but some unintuitive command names and poor screen prompting were fairly unfriendly. Screen redrawing was rather sluggish.

Error Handling: Extensive error messages. Possible to crash the system using the 'COPY' facility.

Facilities:

Arithmetic: + - / * exponentiation and log, average, row and column sum, minimum, maximum, greater, lesser, reduce to integer and a 'row grow' operation. Configuration: Possible to configure for both printer and VDU.

Graphics: No

Interface to other software: Compatible with Masterplaner.

Spreadsheet overlays: Not possible.

Turkey system: No, must use CP/M commands.

Insertions and deletions: Yes

Replication: Has a very weak 'COPY' facility, which appeared to have bugs in it.

Display flexibility: Split screens, variable column width, variable number formats.

Protected cells: No

Formula Printout: Good facility to print the 'logic' of the model

Formula Editing: Yes

Automatic/Manual Recalculation: Yes, but in manual mode it unnecessarily redraws the screen after every command.

Out of memory: Memory left permanently on display, but does not give any special notification at the actual moment it runs out of memory.

Long Jumps: Uses a 'GOTO' command.

Searching and Logic facilities: Has an 'IF-THEN' facility.

Supplier and price:

As this review was going to press, Comshare announced a considerable increase in the price of Plannercalc — it is now £85 plus VAT. Contact Comshare Ltd, 32-34 Great Peter Street, London SW1P 2DB.

Benchmark and other measurements:

Max number of columns: 128; Max number of rows: depends on number of columns; Numeric precision: 10 digits; Max column width: 30 characters.

Benchtests: Due to implementation characteristics of Plannercalc it was not possible to run fully normal Benchtests. These tests were performed on an Apple II with 2MHz Z80 processor using 56K CP/M. Refer to PCW's Feb '83 issue for more information on the tests.

Benchmark 1 — to test calculation speed and capacity: (a) not measured; (b) & (c)

Recalculation time for 20 rows: 27 seconds; (d) Vertical scrolling speed: 120 seconds for 50 lines, ie, 2.4 seconds per line. Horizontal scrolling speed: 28 seconds for 13 columns, ie, 2.1 seconds per column.

Benchmark 2 — not measured.

Benchmark 3 — storage capacity was 61 13-column lines of numbers.



'It's Bob Norris — microchip pioneer...'

BENCHTEST

TI PROFESSIONAL

Robin Webster puts the latest IBM-compatible micro through its paces.

The profile of the new Texas Instruments Professional personal computer is surprising. It is *not* based on a TI chip, it is IBM Personal computer compatible, and it was developed by TI's Data Systems people

rather than the Home Computer division.

Despite the fact that TI already has a perfectly good 16-bit chip of its own – the TI 99000 – and various other designs lounging around on R & D shelves, the

company has taken what might appear to be a self-deprecating route into the corporate microcomputer business by building its new machine around the Intel 8088. TI's perspective on the matter, though,



Photography by John Mason



The disks are set off to the right side of the casing, as with the IBM PC.



A parallel printer port is standard instead of RS232.

was that to try and counter the current software and hardware development trends would amount to financial suicide.

The Intel 8088 chip, while not the fastest or most feature-full device around, has acted as a powerful magnet, attracting significant attention from major computer manufacturers (IBM with its PC, and Digital Equipment with the Z80/8088 Rainbow), and, as a consequence, from the independent hardware/software developers as well.

In the US, where there are many publications devoted purely to what is being done with and to the IBM PC (including *PC World* – which sounds rather familiar doesn't it?) hundreds of specialised products are described each month. All sorts of weird and wonderful things which IBM in its dreams, or nightmares, never imagined could be done with its baby are on offer ridiculously low prices.

And it is this mass of already expended effort that TI is seeking to tap with the new Professional machine. But has TI managed to make it a trivial matter for a user to switch his software development work from an IBM PC to a TI Professional

al? Is the Professional a sufficiently tempting proposition in terms of price/performance to make a potential customer seriously wonder why the IBM machine should be considered by him at all?

As a package, the TI Professional is being pitched as 'The Answer.' It comes in the usual three-part package – processor/memory unit, video display, and keyboard. It is suitably neutral in colour (off-white) to be unobtrusive in most decors. And, emphasising the drip-coffee-maker simplicity of today's machines – in terms of taking them out of the box and setting them up at least – TI states that a customer needs merely to plug the Professional in, run through the built-in diagnostics system, and, if everything is OK, begin work.

That is TI's image of a "corporate" personal computer. So, how does it perform?

Hardware

TI has tried to mirror the IBM PC, but at the same time, add something new.

From the front, the design of the main processor unit closely resembles the IBM

product. It appears to be a little wider, and may be a little lower. The disk drives are set off to the right side of the casing, as with the IBM PC, and the keyboard is attached by means of a coiled, telephone-like, cable. While the keyboard is of a different layout, it has very much the same "feel" as IBM's. The TI video display sits on top of this main unit and, although moveable in a horizontal manner (left or right), it cannot be tilted vertically. While this may cause some problems to people with badly positioned overhead lights, I didn't find any reason to dislike this omission when using the benchtest machine.

The minimum system configuration consists of: a 64K main processor unit containing a basic video controller unit; a TI monochrome (green phosphor) video display; standard TI keyboard; a parallel printer port; five internal expansion slots; and a 320K disk drive. The suggested retail price is £2,075. Larger versions can be supplied with integral 5 or 10 Mbyte Winchester disks.

The observant reader may already have spotted one surprising thing about the standard machine: the common-or-garden RS232C input/output port is missing. The parallel printer port comes standard instead. For another £185, the user can get the optional async/sync communications card, but this will take up one of those precious internal expansion slots. The board is more than just RS232C circuitry, says TI, indicating that the Professional will be able to handle TTY. IBM 3780, IBM 3270 SNA (stand-alone) and IBM 3270 BSC and SNA cluster communications protocols towards the end of the year.

A second thing about the TI machine, which isn't being openly publicised by the company, is that it can read and write disks in the IBM PC format. This would seem to suggest that you can take a 5 1/4 inch disk from an IBM PC and use it directly on the Professional – well, you should be cautious before getting over-optimistic about this.

It would be an excellent situation for TI if all the software developed on the IBM PC could suddenly be handled as if it were TI Professional software, without any

TI PROFESSIONAL

time or financial penalty to pay. Indeed, some TI dealers informed me that this transfer was possible in 95% of cases, and there was some suggestion that TI had managed to come up with sufficiently smart circuitry and/or software to deal with any problems.

Owing to the short time I had access to the TI machine, it was not possible to make controlled performance tests with IBM PC software. What's certain is that in spite of TI's underlying decision to lock into the IBM PC marketplace, hardware differences do exist. The major obstacle in the way of the "put the disk in and run it" approach is the relevant screen resolutions and video circuit design. In the case of the IBM machine, it is possible to address a total of 640 x 200 pixels. On the TI machine the pixel resolution is 720 x 300. My perspective on this is that any customer who really wants to get the TI machine simply to run IBM software is barking up the wrong tree. TI is in the process of making deals with the major independent software vendors for TI compatible products – a little research in this department should give any potential user enough confidence to make the "buy" or "don't buy" decision.

Keyboard

The Professional's keyboard doesn't really look like the IBM model – if you need a comparison, the closest would be the one offered with the Digital Equipment Rainbow – even though it is low-profile, has sculptured keys, and is attached to the system unit by means of a coiled cable. There are 97 keys in all (the Personal Computer has 83 and the DEC Rainbow has 103): 57 qwerty; 18 numeric pad; 5

cursor control, including HOME; and 12 user programmable function keys. The keys have what designers call "tactile feedback," which essentially means that you are easily able to tell when you have pressed the wretched things, instead of having the feeling that you are moving your fingers around in a bowl of jelly. All keys, except SHIFT, CNTRL (Control) and ALT (Alternate), have a repeat action when held down for more than half-a-second.

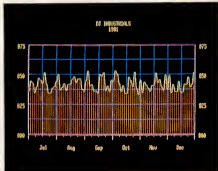
On many keyboards it can be very difficult to locate certain keys when you need them – and it is often the case that cursor control keys are buried somewhere unlikely or are only available when the keyboard is in some SHIFTED mode.

The professional has the sensible arrangement whereby the four cursor direction keys are totally separate from the main keys and arranged in an easy-to-use diamond pattern. The HOME key nestles in the middle of the diamond (this positions the cursor at the top left of the display when pressed).

As with the IBM PC, the Professional keyboard can be adjusted so that it slopes at a particular angle – between 5 and 15 degrees. Two legs on the bottom of unit can be extended or retracted by means of two inconspicuous buttons placed at the top left and top right.

A nice feature is the upper-case indicator light, a small green LED set into the CAPS LOCK key. This can help you avoid, or at least explain, those times when a character you were not expecting appears on the screen, or a particular command is rejected.

In use the Professional's keyboard doesn't ask much of the user. It is simple to comprehend, has a nice response and offers as good a selection of facilities as might be needed by a business user. 256 characters (ASCII) are generated as standard, but this can be doubled to 512



A selection of screen graphics.

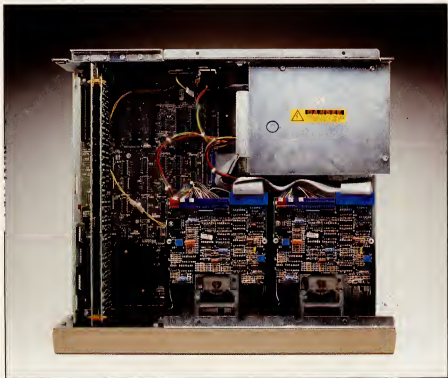
characters if special scientific or foreign language characters become necessary for applications work (Occasionally, the benchtest machine would display a small heart-shaped character, but this wasn't documented anywhere).

A 12 inch monochrome (green) and 13 inch colour monitor are offered by TI on the Professional. The pixel resolution and screen format is the same on both models.

The benchtest machine was a 256K main memory unit with two 320K floppy drives and a monochrome display. Standard memory size is 64K, and 256K is the current internal limit, but expansion up to 512K will be made available later this year. The Intel 8088 cpu has been set to operate at 5 Mhz – as opposed to the 4.77 Mhz of the IBM PC.

To see what the machine could do, I ran through a couple of demo packages that TI supplies to dealers. Demo A was designed for the full colour model and made use of the machine's sound generation facilities (I sneaked into a TI dealer store to use the colour version for a brief time). Demo B was less ambitious and merely led the user through the various system features and future options.

Both demos ran under Microsoft's MS-DOS operating system, and one of the first things I noted was that the official TI operating systems instruction manual referred only to this product – CP/M-86 and the UCSD p-System were nowhere to



With all slots occupied the inside would still not be crowded.

been seen. The reason for this wasn't totally clear, but probably had to do with making the initial start-up and use of the machine as simple as possible for the customer.

Graphics

Both demos were menu-driven and used the full graphics capabilities of the display. During the section on the system components, each modular unit (system/display/keyboard) was shown in a different colour along with explanatory text. It was a useful way of explaining the role of the bits and pieces.

On choosing the section dealing with the display/colour generation capabilities, I came across one of the problems to beware of in developing graphics program routines on a colour machine and then showing them on a monochrome version. At one point, the demo attempted to show the potential customer the different kinds of graphics that can be created. There were line, bar and pie versions. On running the demo on the monochrome machine, parts of the pie chart were almost totally invisible. This turned out to be because those parts were originally given a blue colour and this did not register well on the green phosphor.

A rather impressive part of the graphics display came in the image animation section of the demo. An aircraft engine turbine was drawn by the software and then rotated to the accompaniment of a sound not unlike a turbo-prop engine. At regular intervals the program would also change the colour of the blades. It was a good example of how graphics/sound/and colour can be intermixed to great effect.

The Professional's ability to mix text and graphics on the same screen is a definite plus when compared to the IBM PC's rather less salubrious capabilities in this department.

Having raised your expectations as far as graphics are concerned, I shall now deflate them slightly. The problem in all this is that the Professional does not come with the full 720 x 300 pixel bit-mapping facility as standard – just as you have to fork out another £185 on the serial communications card, you must also buy the relevant graphics board as an optional extra.

The standard machine can only display alphanumeric characters and those jagged graphics as seen on most computers. To get into serious work you must buy either the 1-plane board (£260) which allows you to do two-colour or two monochrome shade graphics, or the 3-plane board (£450) which provides up to 8 colours (black, red, blue, magenta, green, cyan, yellow, white) or 8 colour shades.

The video display draws its power from the main system unit, via a lead plugged into the back of the main casing. If the video display power switch is left on, it is possible to turn-on or shutdown both devices by means of the single on/off switch set in the righthand side of the main unit.

As mentioned earlier, the front of the system unit looks pretty much like the

Texas Instruments Professional Computer DIAGNOSTICS Version 1.20 (C)
Copyright Texas Instruments, Inc. 1982.

Overall Unit Test	Yes No
CRT Test	Yes No
CRT Graphics Test	Yes No
Diskette Verify Test	Yes No
Diskette Read/Write Test	Yes No
Keyboard Test	Yes No
Memory Test	Yes No
Parallel Printer Test	Yes No
Communication Port(s) Test	Yes No
Display System Configuration	Yes No
Print Test Results	Yes No

Select appropriate test(s) and press ENTER ...

Fig 1

CP/M-86 Function Key Programmer for the TI PC Version 1.0

Type the Function Key you wish to program, or ESC to display the other set of keys, or Carriage Return to exit this program.

```

F1: DIR A: OD
F2: DIR B: OD
F3: STAT OD
F4: STAT
F5: STAT A: * OD
F6: STAT B: * OD
F7: PIP
F8: PIP LST:=
F9: FORMAT OD
F10: FUNCTION OD

```

Fig 2

IBM PC design, and a peek around the back of the Professional doesn't contradict that.

To the left of the unit (rear view) there is the main AC power inlet with the video power outlet set a couple of inches to the right. Just off-centre to the left is a powerful, and fairly noisy, cooling fan. TI probably opted for the high-throughput fan since the system unit has a large internal transformer supplying all the pcbs, disk drives, and the video display. Although I feel that it could have been a little less noticeable, the fan noise never really became irritating.

Moving further over to the right, there is a DIN connection for the keyboard cable set alongside the 25-pin parallel printer port. The right side of the back is given over to the five expansion slots.

Inside

The benchtest machine came with the three left-most I/O ports empty, the fourth port allocated to a 3-plane video board (even though the display was monochrome), and the fifth slot was occupied by a serial communication board.

The whole arrangement was very neat and uncluttered. Each I/O slot in the casing that was not yet filled was blanked off by means of a formed aluminium plate, held in place by an easy-to-remove screw. To get access to these screws, or other components, the main casing must be removed. TI has really made this operation very simple. Only two screws, located at the upper-left and upper-right of the back have to be undone whereupon the lid can be pulled off.

The review machine was fairly empty, but even with all slots occupied the inside would still not be overcrowded.

All five I/O slots are seated on a large motherboard about a foot square which contains the Intel 8088 chip. The motherboard lies flat on the bottom of the system unit: one end is hidden under the power supply and one of the disk drives. Simple snap-on plastic clips retain it in place. It is important to note that the TI boards are not the same design as those in the IBM PC, so don't expect to find bargains in that direction. Undoubtedly, the add-on vendors are busy making products to the TI board design specifications (see section on software).

The rugged-looking power supply is totally enclosed in a sheet metal casing. Nothing looked like it would take more than a few minutes to service, and no special tools are required.

Along with the launch of the Professional, TI has announced a new dot matrix printer called the Omni 850. This is a fairly low cost machine, about £500, with a print speed of 150 characters per second. It can print bi-directionally at 150 cps using a 9 x 9 character matrix, or it can give an enhanced print quality at 90 cps using a 15 x 9 character matrix.

Possibly its strongest recommendation is that it can reproduce the graphics images on the TI Professional's screen on a dot for dot basis by using a raster graphics technique.

The Professional can run the operating systems now expected on any corporate micro: CP/M-86, Concurrent CP/M-86, CP/M-80, MS-DOS and the portable UCSD p-System. Languages currently available under these operating systems

TI PROFESSIONAL

include Basic, Pascal, Fortran, and Cobol.

The review machine came with the MS-DOS and CP/M-86 operating systems, an MS-Basic disk and a Digital Research CBasic disk which had met some unknown fate since it was blank!

Currently, TI is supplying MS-DOS version 1.25 on the Professional and has used MS-DOS as the "example" operating system in its operating manual for the machine.

To boot the system, you can either insert the system disk in drive 'A' and restart the power on, or you can do a switch by pressing the CNTRL, ALT and DEL keys at the same time. This three-key re-boot could be criticised as being excessively cautious, but I guess it's better than finding out you've hit a one-operation reset button accidentally.

After switching on, the Professional goes through a 10 or 20 second self-test routine before actually loading disk contents into memory. The diagnostics routine is held in ROM and is linked to three coloured lights (green, yellow and red) set in the left side of the machine, as seen from the front, and which flash on and off during the test.

If everything is OK, the lights all go out at the end of the test - one or more will stay lit or not light at all if something goes awry. By noting the light activity or non-activity, it is possible to figure out what's going on.

A more detailed troubleshooting capability is made possible by inserting a TI diagnostics program disk. By doing a restart with the disk in the main drive, the user is provided with a number of test options to choose from (see Fig 1).

To use graphics commands in MS-Basic, the high-resolution graphics controller board must be installed. Once that's done, it is possible to create programs that use commands such as LINE, COLOR, PAINT, DRAW, POINT, and PALETTE, to create screen images.

The CP/M-86 disk supplied with the benchmark machine was marked "prototype version" but it nevertheless seemed to act exactly the same as CP/M-86 on other machines.

One nice facility, though, was the Function Key Programmer routine which has been tailored to the TI Professional keyboard. After booting up the system, the user can type in the word FUNCTION which loads the key programming code. (Doing this on the review machine resulted in the screen as shown by Fig 2).

This kind of feature is a great time-saver especially when you are using CP/M's somewhat cryptic command sequences.

It may be noticed that while the keyboard has 12 function keys, the CP/M-86 function routine only shows features for ten keys. This is because the F11 and F12 keys are being reserved for the communications software that will be made available in the future

For those users who want to use CP/M-80 programs on the Professional, a small company called Xedex has done it again. When the IBM PC came out, Xedex quickly brought out the Baby Blue plug-in Z80 board which turned the PC into a CP/M-80 machine. Xedex has now brought out the Baby Tex card, which does exactly the same thing. UK prices for the Baby Tex are not yet fixed.

Other than these specifics, there were no surprises in terms of how the two operating systems worked on the Professional. The benchmark programs were written in MS-Basic and gave the kind of results one would expect from a 5MHz 8088, indicating that TI had done nothing unusual at the circuit level.

Documentation

Of the four manuals made available with the machine, only three were in their final form: the TI Professional Operating Instructions manual, the MS-DOS operating system manual, and the MS-Basic manual.

All were professionally printed in small-book format with page numbers, headings, and - most importantly - a contents index. While someone who was familiar with computers might find the Operating Instructions a little slow to inform, the first-time-ever user will welcome the attention to detail. If TI thinks there is something that must be noted carefully, a small doorkey symbol is placed in the margin next to the relevant text. The choice of subjects highlighted in this way (how to handle disks, what *not* to do if problems occur, etc) appeared to be sensible. Error messages, such as: **System Error** - 0020; or **Keyboard Error** - 0010, were generally explained in a simple manner, and MS-DOS error messages were covered at the back of the manual. Extensive use of high quality line drawings of the equipment and screen made the documentation quite pleasant to use. Naturally, the MS-DOS operating system and MS-Basic books were more comprehensive, but they still are unlikely

to scare off a user.

The CP/M-86 system documentation was not a TI version, but a collection of Digital Research generic operating manuals and photocopies of TI specific information. This was less easy to work with, but the TI-produced version should be up to the MS-DOS literature standards when it becomes available.

Potential

To try and get a real feel for the TI Professional, we should probably think less about its contact points with the IBM PC, and more about its special features.

For example, later this year TI is intending to offer a natural language interface and speech I/O facilities that can be used in database query applications and program input/output, respectively. I managed to get a look at a prototype of both products at the West Coast Computer Faire held in San Francisco during March.

Generally, I thought the natural language interface worked fairly well, if slowly, when I tried to build a query about a particular airline's flight schedules.

The display screen can be split up into many (six or seven is a reasonable number) different sized windows that contain specific types of words or phrases relating to the database information.

A typical query example might be the sentence "Find me the airline with more GOTO page 233

Benchmark timings

Benchmark 1	1.00
Benchmark 2	4.20
Benchmark 3	9.30
Benchmark 4	9.70
Benchmark 5	10.50
Benchmark 6	19.00
Benchmark 7	29.50
Benchmark 8	31.00

All timings in seconds. For an explanation and listing of the Benchmark programs, see PCW November 1982.

Technical specifications

CPU:	Intel 8088, 5MHz
Memory:	64K RAM, expandable up to 256K 8K ROM, expandable up to 16K
Keyboard:	97 keys (57 typewriter, 18 numeric pad, 5 cursor control, and 12 programmable special function keys). Upper/lower case character generation.
Screen:	12 inch monochrome (green phosphor) screen or 13 inch colour version. 80 cols x 25 lines display format. Both have 720 x 300, memory-mapped pixel resolution. 1-plane video board gives monochrome or two-colour generation. 3-plane video board gives 8 colours or shades.
Disks:	Standard unit comes with a single 320K, 5¼ inch drive. Options are 2x 320K floppy drives, or one 5¼ drive plus a 5Mbyte or 10Mbyte Winchester unit.
I/O Ports:	Parallel printer port as standard. Optional Sync/Async RS-232C communications board.
Software:	MS-DOS, CP/M-86, Concurrent CP/M-86, UCSD p-System. CP/M-80 (with plug in Z80 Baby Tex board from Xedex).
Languages:	MS-Basic, C-Basic, Pascal, Fortran, Cobol as standard, but many others already on the IBM PC (Forth, for example) will probably be moved over too. A Natural Language interface for database applications is also on its way.

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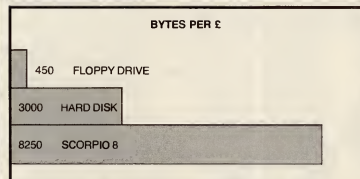
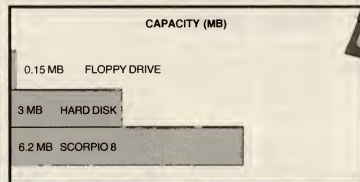
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Please note that Len cannot answer questions on an individual basis,
so please don't send an SAE with your query.

Edge wear

I use CBM 4032 and CBM 8032/96 machines with associated peripherals. With both of these I regularly use either the cassette unit or a range of dongles (PETAID, Administrator, Wordcraft, etc). I am concerned that my edge connector on the first cassette port will wear out prematurely. Can this be easily/cheaply repaired?
R A Heesterman, Sheffield

A standard edge connector, with 1/10 inch contact spacing on 1/16 inch thick circuit board, can be repaired by fixing on a strip of edge plug material. This is a moulding which slots over the edge of the PCB. It is easy to trim to length before fixing. The business end has gold-plated edge connector fingers, and the rear has formed wire tails which are soldered directly on the original contact strips to secure it. Be sparing with the solder, and clean off any excess flux to make sure it is not hiding solder splashes which might short your signals.

Timedata Ltd, 16 Hemmells, High Road, Laindon, Basildon, Essex, SS15 6ED, sells a strip meant for ZX81 (23+23 way, polarising slot position 3), as edge connector plug HZZ, price £3.50 inclusive. A 43+43 way strip, polarising slot 37, is available as RS Components stock number 468-709. Try asking your local electronics shop or TV repairer to order it for you.
LSW

Tracking down the Trackball

Could you tell me where to obtain one of the ball-type joystick controls as used on arcade video machines?

Also, where can I obtain a book on the subject of building a computer from scratch using a CPU such as the 8088 16-bit processor?
D C McGibbon, Edinburgh

The 'Trackball' joystick is of the type you describe, and is available from SBD Software, 15 Jocelyn Road, Richmond, Surrey, TW9 1BR (tel 01-948 0461). They currently list it as being available for both the Apple and the Atari.

It is probably a bit early for there to be books available on building your own 16-bit microcomputer. However, a three-part article on building your own micro based on the 8088 chip appeared recently in *Byte* magazine: 'Build the Circuit Cellar MPX-16 Computer System', by Steve Ciacia; Part 1 (November 82) page 78; Part 2 (December) page 42; Part 3 (January 83) page 54.
P L McIlmoyle

FOR the NEXT problem...

I have a problem with FOR...NEXT loops on Microsoft Basic. I know of two ways of getting a 'NEXT without FOR' error — one is not specifying a FOR before the NEXT, and another is allowing the computer to enter the loop between the FOR and the NEXT. However, I am getting this error in some third way I do not understand. It may have something to do with jumping out of other FOR...NEXT loops, which is supposed to be permissible.
J R Sampson, Bramhall, Cheshire

Jumping out of FOR loops is usually poor programming technique. The FOR loop is designed to repeat the execution of a block of statements a predetermined number of

times. If the number of repetitions cannot be determined until the loop is executing, then you should be using a different control structure. A WHILE...WEND loop may be what you need. If it is not available in your dialect of Basic then it can be built out of IF and GOTO statements.

There are two reasons why jumping out of FOR loops is allowed by Basic. One is that, in the earlier Fortran DO loop, jumping out to the 'extended range' is allowed, provided you jump back in. The other is that Basic interpreters find it difficult to stop you. When you keep leaving by jumping, you clog up Basic with dead stack entries until an error is caused. Don't do it.
LSW

History project

I'm doing a project on the history of computers. Could you tell me where I could get information on the subject?
Antonio Geada, Cashel, Co Tipperary

I am sending you a useful little booklet, which is now unfortunately out of print. Also, computer science books often have a chapter on the history of computers. You should make friends with your local librarian, who can help you build up a list of books and get them for you. Perhaps you might like to start with *The Making of the Micro: a history of the computer* by Dr Chris Evans, Gollancz 1981.
LSW

The working Spectrum

I would like to know whether if I bought a Sinclair Spectrum it could help me with my work? Also, could it ultimately be con-

nected up to a mainframe computer?

John Ives, Maldon, Essex

Obviously the Spectrum is far from the ideal business computer, but with the right software/hardware it can be quite useful. For example, an electronic spreadsheet program, such as VU-CALC or Video Software's Superplan, can be used for financial forecasting or for job costing or estimating, while a records management program like Campbell System's Masterfile can bring a card index to your fingertips and do sophisticated searching automatically. Hilderbay Ltd has concentrated on business needs and has several payroll and accounting programs available.

On the hardware side, East London Robotics Ltd offers RAM expansion to 80k, though the software suppliers have yet to take advantage of this. Cobra Technology Ltd makes an RS232C communication interface which should enable you to exchange files with a mainframe or link to a network.
James Walsh

Easy assembly

I bought the BBC micro in order to learn assembler language programming, as it has an assembler built into its Basic. Can you recommend a suitable book to help me?

J Tinsley, Manchester

Assembly Language Programming for the BBC Microcomputer, by Ian Birnbaum, published by Macmillan at £8.95, is probably the best currently available. The microprocessor used is a 6502, so any book based on that processor will help you, and there are many available — the two most popular being by Scanlon and by Leventhal.

However, in my view it is quite difficult to learn it from a book. It would be a good idea to join a local BBC user group (you can find details of local groups in *Beebug* magazine), and latch on to someone who will lead you through the beginning stages. **BEEBUG** — Independent User Group for the BBC Micro

Spectral correspondence

I run a small business and am considering buying a word processor to handle day-to-day correspondence. I already own a Sinclair Spectrum and have heard that Sinclair is working on a word processor package. Will it be sufficient for my needs, or will I need a more expensive set-up?
Mike Smith, Ilkley, W Yorks

Even with a good word processor, the Spectrum is limited by the printer quality and, until the Microdrive arrives, by the inconvenience of tapes. A correspondence quality printer would cost £300 to £500, and an RS232 interface £30. Even then, the Spectrum keyboard is hardly up to regular office typing.

If you want a relatively cheap 'real' business computer package, your best bet would be the Osborne. Because it comes complete with Wordstar, a well-established word package, Supercalc and Basic, and because of the full-sized keyboard, double floppy disk drives and CP/M, it is much more suitable for general office duties. However, you will be paying around £1600 for a package including a printer. You must balance this cost against the improved performance, and the availability of other useful business software under CP/M.

James Walsh

Forth fills the gap

Your February answer on Spectrum Forth was very interesting. I find Basic on my ZX81 runs too slowly,

but machine code is very difficult to write and to run.

Would Forth help to fill this gap? Do I have to make any chip changes to run it? Now I have a Spectrum too, I feel like experimenting with my lesser machine.
N Barrington, Timperley, Cheshire

On most micros, ZX81 included, Forth is just another machine code program on tape. You should find it solves your speed problems, and also allows you to incorporate small machine code routines quite easily. This is especially useful if you are testing hardware add-ons.

Since the February answer, I have seen three versions of Spectrum Forth advertised, at prices between £6 and £20.
LSW

Talking back

How can I get my micro to talk? I have seen fairly cheap talking clocks, so is there anything I can add to my machine to make it speak?

P Harris, London

Consumer goods with a limited vocabulary often use a speech synthesis technique based on storing a digitised speech waveform. The speech quality can be very good, but you are limited to the vocabulary supplied in the manufacturer's ROM. Another method is called phoneme or allophone synthesis, where the speech chip models the vocal tract and is driven by a series of codes for the syllables. This allows you to make up any word you like, but the quality is not so good. Two chips are available, with very similar performance, the Votrax SC-01A and the GIM SP0256.

Maplin (Rayleigh, 0702-552911) supplies the GIM SP0256 chip at £8.98, and simple kits for either VIC or ZX81 at £24.95.

William Stuart Systems (01-221 1131) supplies the Chatterbox, again using GIM, at £39 kit or £49 built. This also provides a port for a speech recognition unit.

Neither of the above has a vocabulary supplied.

Namal Associates, 25 Gwydir St, Cambridge (0223 355404) produces the Super-

talker, using the Votrax chip which allows speech inflection. I have one on my ZX81, and it has given it a whole new personality. This includes a dictionary of over 550 words plus driver routine in ROM and RAM space to extend the dictionary, or you can drive it direct with phoneme codes. The ZX81 version is £49.95, Spectrum £69.95, and RS232 for any computer £89.95.
LSW

Beeb block bug

I have a BBC Micro Model A with 32k and the 0.1 operating system. Recently I typed in a program and **SAVED** it on tape. When I tried to **LOAD** it again I was horrified to find that the computer refused to recognise the first block, and so I could not load the program at all. Is there any way that I can load back my program starting from block 0001 onwards?

TA Kayani, West Hampstead, London

The problem that you are experiencing is solely due to a bug in the 0.1 operating system. This has been cured on the series 1 operating systems. We published a 'fix' for this bug in the July issue of *Beebug*, however this does not help you recover a corrupted tape but only stops it happening in the first place. In the November *Beebug* we published a program to recover a corrupted first block. It is too long to print here so I have sent you a copy.

The long term solution is to replace your 0.1 OS by a 1.2 OS, and all BBC micro owners should be doing this now. The price is around £10 if fitted by a dealer, but

Beebug has a special members' price of £5.85 including VAT and p&p. It is easy to fit yourself but requires a bit of care.

BEEBUG

Interface standards

I have seen references in *PCW* and other journals to an RS423 interface but have not seen any detailed des-

criptions of how this standard works and what the various lines do.

- How does RS423 compare with RS232C or V24?
 - Can an RS423 interface be connected to an RS232C modem or printer? Could an adapter be made?
 - Is RS423 likely to supersede RS232C?
 - Would there be any advantage in building an RS423 interface into my existing computers, MZ80B and Acorn Atom, neither of which have RS232C?
 - Where can one buy the necessary 5-pin sockets?
- S C Craddock, Sholey Bridge, Consett*

All these standards are designed for connecting things like teletypewriters or computers to telephone company modems, but they have been used in a simplified way for connecting computer to printer or computer to computer. There is a detailed article on this subject in *Byte*, February 1981.

Broadly speaking, RS232C and V24 are the same, but are published by different organisations. RS423 signal levels are compatible with RS232C and V24 equipment, but RS423 is suitable for driving longer cables. RS423 is also compatible with RS422, which is much more suitable for signalling in difficult conditions.

RS449, an interface standard which uses RS422 or RS423 signal levels, and the European version X21, will one day replace V24, etc, for telecoms. Peripherals manufacturers will make their own choices.

There are line driver and receiver ICs which make either interface easy but, for a printer, a Centronics interface avoids the need for extra positive and negative supply rails.

The 5-pin socket is not part of the interface standard, it is just, Acorn's bizarre choice of a standard but uncommon reversible DIN audio connector for non-reversible signals. Use something else.
LSW



THE MUSIC MAKER

SOUND TECHNIQUES FOR THE BBC MICRO

How to be creative with sound on your BBC Micro: Chris Jordan explains

The BBC Microcomputer boasts an advanced sound-generating system more powerful than that fitted as standard to any other personal micro. As is often the case with innovative products, users have been slow to realise its possibilities, and creative application currently lags far behind the potential for music and sound effects that the BBC Micro offers. As evidence, witness the almost total absence of articles (except in *PCW*) on creative use of Beeb sound, as compared to an abundance on the subject of graphics. This is only partly due to the traditionally second (or even lower) place that sound takes to graphics in the league of selling-points for micros. Crash-courses in use of the SOUND and ENVELOPE statements are not the whole answer, especially since interesting sound programs can be written without using the more advanced and at first baffling features such as envelopes. The BBC Micro's sound system actually makes sound programs that do simple things like play tunes much easier to write, as well as providing more complex control options.

User options

One reviewer has stated (not in *PCW*, of course) preference for the direct method of

sound control used on the Vic 20 and Commodore 64 over the Beeb's SOUND and ENVELOPE statements. This is a cruel verdict indeed (if you take it seriously) since the Vic and 64 represent the zero option in system sound software. The user's program gets absolutely no help in using the sound generator IC, having to POKE unfriendly values direct to its various registers. In comparison, the Beeb provides a friendly, high-level interface that bridges the large gap between controlling the properties of a sound, and controlling the sound chip. In particular the operating system knows about the musical scale, and it handles the timing of sound events — a task which Basic is not good at, and which, from a musical point of view, is useful to take for granted. The operating system runs concurrently with the Basic program, called up at regular 10 micro second intervals to service the sound, speech, keyboard, A-D converters and software timers. This lets it produce envelopes, programmed durations and sound sequences which are initiated by SOUND statements but run on automatically without holding up the user's program.

Remarkably, the variety of sounds that the Beeb can make owes very little to the sound generating hardware. The Beeb uses the Texas SN76489 — a device of very modest specification and performance which is similar to those in Atari, Texas and Sharp micros. The obvious conclusion is that these machines are potentially as powerful as the Beeb in the sound department, and this is perfectly true. What makes the difference is the software that drives the chip. Interrupt-driven machine-code routines are way beyond the abilities of most users, so if the system designers don't give them the facilities, a fascinating world of creative computing remains largely barred to them.

What is needed is applications software to put this situation right. For example, how about a program that adds SOUND and ENVELOPE statements to a particular micro's Basic? All that this would demand of the machine is a typical Texas-GI type sound chip and a hardware timer that could be programmed to cause interrupts, for example the ubiquitous 6522.

the basis or sound synthesis, and on a more fundamental level, all music. The complete spectrum of variations runs from those that happen over periods of minutes — the domain of musical form and structure — right up to the microsecond timescales of audio waveforms, where the tone quality, or 'timbre', of sounds are determined. We can easily divide this spectrum up into bands, each containing variations of similar timescales and with related effects on the audio product. The result is a scheme that gives valuable insight into the subject of micro sound, and sound synthesis in general.

In the context of making music and sound effects with micros, three broad (and overlapping) divisions of this spectrum cover most points of interest. They are:

1. From infinitely long times up to about 100ms. This includes most of what we think of as the structures of music — from whole pieces at the low end, through movements, verses/choruses, passages, phrases, bars, and up to and including individual notes.

2. From 1 second to 1 ms. This is the realm of envelopes, vibrato, tremolo etc — variations that run within notes. We can make out their individual stages, and hear them as actual variations in pitch, amplitude etc., but the casual listener perceives them as integrated parts of the sound's character.

3. From 50ms up to around 50 μ s, the upper limit of hearing. This is the frequency of the sound itself. The variations that constitute the sound waveform are responsible for the fundamental properties of timbre and amplitude. All other effects are specific variations of these parameters.

Division embodies the whole point of fitting sound generators to micros — we want to be able to generate sequences of notes to make music, organise sounds for pure abstract entertainment, and produce sound effects on command to enhance games. The requirements at this level are simply the basic computational functions of a computer, sound or no. For example, the amount of RAM and availability of disk storage might determine the maximum length of a recorded composition that was to be played in real-time, but this applies just as well to the amount of stored text available in a game of adventure.

Division 2 is where creativity takes a quantum leap and where the Beeb really scores — the possibilities for different

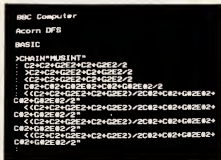


Fig 1



Fig 2

Timescales

Variation of sound parameters over time is

musical 'voices', effects like chorusing, echo and ambience, and a mind-boggling diversity of abstract sound effects amounts to as much creative power per pound as many dedicated electronic instruments, including organs and synthesisers. This is the timescale where Basic begins to get left behind, and user or system machine code is needed to compute the varying pitch and amplitude values, using parameters supplied by Basic, and send them to the sound chip.

The dividing line between divisions 2 and 3 is very hazy. So far, there is only one single-chip sound IC with true control of sound waveforms, and the simple ones are confined to square, pulse and noise waveforms. However, their range of timbres can be extended by changing input parameters at a rate approaching that of the waveforms themselves, though often at high cost in terms of processor time. Update frequencies of around 50 Hz are a good compromise, and the sounds produced, although too rough and variable for music, are great for sound effects.

On the BBC Micro, this is done with the pitch envelope, which can 'scramble' the sound in different ways to yield interesting compound tones. A lucky accident means that a SOUND duration of zero can also be applied in this way, repeated by a fast Basic loop which provides a new pitch for each short (10ms) tone segment.

This article looks at some basic programming techniques which relate to timescales at the top end of division 1, controlling the duration of notes and the speed of sound sequences. This is a good starting point for those getting to grips with the BBC Micro's sound facilities, since duration control is fundamental to all musical programs. Beeb sound is well endowed with control options in this area, and many are unique to the machine.

Run this short program:

```
30 pitch%=0
40 REPEAT
50 FORinc%=3TO5
60 pitch%=pitch%+inc%
70 SOUND1, -15, pitch%*4.2
80 NEXTinc%
90 UNTILO
```

It plays a sequence of three rising major arpeggios that repeats until you hit ESC. Stop for a minute and think about what determines the tempo of the sequence. If this only takes a second, you've probably already taken one feature of Beeb sound for granted. Although the program appears free to run around the two nested loops as fast as the interpreter will take it, the note from each execution of the SOUND statement lasts for about a fifth of a second. Assuming the machine doesn't have unlimited storage for a backlog of SOUND requests, and also that it plays every one that the program generates, we conclude that the SOUND statement is being executed about five times a second, and therefore that the program runs at the correspondingly slower rate.

The operating system is what keeps the program execution in line, by the simple process of not letting Basic proceed when it asks for a sound which cannot be dealt with. This happens when a previous sound is still

```
10 REM Music Interpreter
20 REM Creative Sound on the BBC Microcomputer
30 REM Acornsoft (C) 1982
40
50 DIMtext%255,bstack%10,estack%10
60 scale$=" C D E F G A B"
70 in1$=STRING$(255," ")
80 temp$=STRING$(255," ")
90 $text$=""
100
110 ONERRORGOTO1050
120
130 REM Main Loop
140 REPEAT
150 pitch%=0:amp%=12:slur%=0
160 PRINT": ";INPUTLINE" in1$
170 IFLEN in1$()>0:$text$=in1$:GOTO210
180
190 REM If CR, repeat with old text
200 PRINTCHR$(11) " $text$
210 estack%?0=0:sp%=0:oct%=1:tem%=2
220
230 REM Play complete text
240 PROCPLAY(0,LEN $text$)
250 UNTILFALSE
260
270 DEFPROCPLAY(chn%,echn%)
280 REM UNTIL chn%=echn%
290 IFchn%=echn%:ENDPROC
300 temp$=(text$+chn%)
310 dur%=VALLEFT$(temp$,INSTR(temp$+"E","E")-1)
320 IFdur%(1:GOTO400
330
340 REM Duration found - play note
350 chn%=chn%+LENSTR$dur%
360 SOUND1,-amp%,(pitch%+oct%*12)*4,tem%*dur%
370 IFNOTslur%THENSOUND1,0,0,0
380 amp%=12:slur%=0
390 GOTO1020
400 ch$=text$?chn%
410 IFch$(ASC"A"ORch$)ASC"G":GOTO460
420
430 REM Note name found - update pitch
440 pitch%=INSTR(scale$,CHR$ch$)
450 GOTO1010
460 symb%=INSTR("###(){}[]^_` ",CHR$ch$)
470 IFsymb%=0:PRINT"UNEXPECTED "CHR$ch$:GOTO490
480 ONsymb%GOSUBS20,570,600,670,720,810,850
,880,920,950,980,1010
490 GOTO1010
500
510 REM " - Repeat last phrase
520 IFestack%?sp%=0:GOTO1000
530 PROCPLAY(bstack%?sp%,estack%?sp%)
540 RETURN
550
560 REM # - add one semitone
570 pitch%=pitch%+1:RETURN
580
590 REM ( - start new phrase
600 IFsox%=10:GOTO1000
610 bstack%?sp%=chn%+1
620 sp%=sp%+1
630 estack%?sp%=0
640 RETURN
650
660 REM ) - End Phrase
670 IFsp%(1THEN1000
680 sp%=sp%-1
```


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```

690 estack%?sp%chn%
700 RETURN
710
720 REM ) - Increase tempo
730 IFtem%=1:GOTO1000
740 tem%=tem%-1:RETURN
750
760 REM ( - Decrease Tempo
770 IFtem%=5:GOTO1000
780 tem%=tem%+1:RETURN
790
800 REM [ - Down octave
810 IFoct%=0:GOTO1000
820 oct%=oct%-1:RETURN
830
840 REM = - Slur or tie notes
850 SLUR%=1:RETURN
860
870 REM ] - Up octave
880 IFoct%=5:GOTO1000
890 oct%=oct%+1:RETURN
900
910 REM / - Rest i.e. zero amplitude
920 amp%=0:RETURN
930
940 REM ^ - Accent
950 amp%=15:RETURN
960
970 REM b - subtract one semitone
980 pitch%=pitch%-1:RETURN
990
1000 PRINT"ILLEGAL"CHR$(chn%)
1010 chn%=chn%+1
1020 GOTO290:REM REPEAT
1030
1040 REM Error Handler
1050 IFERR=17:PRINT:GOTO140
1060 REPORT:@%0:PRINT" at line "ERL"

```

Program 1

playing (by virtue of what is a long duration compared with program execution times), and the system's backlog capacity is already in full use. When the SOUND currently playing finishes, the OS has room to take the latest request, and Basic is allowed to run again until it hits the next SOUND statement.

By this process the sound durations control the speed of the sequence. Decreasing the value of duration (the last SOUND parameter) speeds up the sequence, and increasing it slows it down. This applies to a whole range of programs that play sequences, rhythmic patterns, tunes, in fact any program with the sole job of generating sounds in a self-timing fashion.

Program 1 is one of these, and uses only the basic SOUND parameters — amplitude, duration, and pitch — demonstrating the simplest use of SOUND in producing music. It's a Music Interpreter that plays single-voice tunes entered directly in a simple Music Composition Language (MCL) with instructions for controlling note pitch and duration, adding accents and slurs, repeating phrases etc. The Interpreter is not intended for replaying stored compositions, but rather as a compositional aid. One

almost serious use it has already been put to is copying and composing signature tunes for games.

Instruction set

The instruction set uses numbers and single characters with a very simple syntax, so that learning it involves little more than remembering the symbols. The minimum code to play a note consists of the note name (C,D,E...B and / for a rest), followed by a number that indicates duration. The note can be sharpened, flattened, accented and/or slurred by adding the appropriate symbol before the duration (before or after the note name). The note plays in the current octave, which can be moved up and down to cover the full five octave range. The actual duration of the note also depends on the tempo, which can be increased or decreased at any point. The tempo resolution is poor, due to the 50ms resolution of SOUND's duration.

Any group of instructions can be enclosed in curved brackets, and a single repeat instruction plays the last bracketed group once. A group can be repeated any number of times, but watch out for groups

that leave the octave or tempo changed — the changes will accumulate. Repeat groups can be nested up to ten deep.

Spaces are ignored and can be included to separate phrases, bars etc.

The full MCL instruction set can be seen in Fig 3.

The only rule that applies to the order of instructions for a note is that the duration comes last. Readability is improved by putting the accent and slur symbols before the note name, and the accidentals after. Similarly, octave and tempo changes are clearest if put between notes.

Here are some short examples that demonstrate use of the instructions:

A rising C major scale

C3 D3 E3 F3 G3 A3 B3 C#4

A rising D minor scale

D3 E3 F3 G3 A3 Bb3 C#4 D6

The same, faster and an octave lower

> [D3 E3 F3 G3 A3 Bb3] C#3 D6

The same, with accents and slurs

> [^ D3 = E3 = F3 G3 ^ A3

= Bb3] C#3 AD6

The same, played four times

> [(^ D3 = E3 = F3 G3 ^ A3

= Bb3] C#3 AD6 " " " "

The Interpreter prompts for the line of instructions to be entered (up to 255 characters long). It plays the tune as soon as RETURN is pressed to end input. To repeat the tune, press RETURN, and to stop it before the end, press ESC. Use the standard cursor-editing technique to make modifications, and hit BREAK to leave the program.

Attempts to pass the limits of octave and tempo, or to repeat an incomplete phrase, produce the message ILLEGAL X, where X is the offending symbol (< > — or "). Any unrecognised character gives the message UNEXPECTED X, where X is the character. After printing either of these messages, the interpreter carries on with the next instruction.

Playing tunes

The program is quite short, partly because there's little source decoding and syntax checking to do. The procedure PLAY contains all the interpretive works. Each call of PLAY interprets and plays a section of the source text, the start and finish positions of which are handed over as the values of its arguments. The first call asks for the whole source text to be played, but when a repeat instruction is found, PLAY is called recursively to replay the last bracketed phrase of the tune. Two stacks (bstack% and estack%) keep a record of where these phrases start and finish. Each time PLAY reaches a bracketed phrase, its limits are saved on the stack above those of enclosing phrases overwriting any previous phrase on the same level. The repeat instruction simply calls PLAY with the limit values from the top of the stack.

Procedure PLAY analyses each source character in three stages. First it tests whether the character is a number (line 320). If so, the SOUND values are worked out from the options and values already set by other instructions, and the note played (line 360). A short silent

C,D,E etc
/
1,2,3 etc.
space
±
b

Set pitch (in current octave)
Set zero amplitude for rest
Play note with this duration (using tempo)
Do nothing
Sharpen note
Flatten note
Accent note
Slur or tie next two notes
Move up one octave (upper limit=+3)
Move down one octave (lower limit=-1)
Increase tempo (upper limit=+3)
Decrease tempo (lower limit=-1)
Start phrase
End phrase
Repeat last phrase

Fig 3

sound separates the next note if no slur instruction has appeared. Note the fudge on line 310 that prevents the VAL function from treating the note name E as part of a number in scientific notation.

Line 410 tests whether the character is a note name, and updates the pitch if it is. The string 'scale' gives each note its correct pitch by virtue of the character's position. All remaining instructions are 450, and the mammoth ON GOSUB at line 480 selects the subroutine appropriate to the instruction.

Flushing sounds

The SOUND statement provides an alternative to specified duration, for situations where a program needs to start a sound playing, and then stop it after some undefined period of time. Duration -1 produces 'infinite' duration, whereupon the sound plays until terminated by ESC, BREAK, one of a variety of *FX commands, or a SOUND request with the flush option selected. A flushing SOUND request clears its channel of any requests that are playing or waiting, and then sounds as normal. To select flushing action, the second hex digit of the channel parameter is set to one. For example

```
SOUND &11,-15,100,5
produces an immediate bleep on channel 1 whatever other sounds there are playing or waiting. A short zero-amplitude sound request can be used to stop infinite duration sounds silently after a delay. The following line of Basic plays a tone that continues until any key is pressed:
SOUND 1,-15,100,
-1:A%=GET:SOUND &11,0,0,0
```

This method is still not perfect for general application. The Basic program can kill the sound instantly on command, but it can't be sure what length will result since the infinite duration sound may have had to wait for a previous sound to finish. It might not be heard at all.

The solution is to make both requests flushing ones so they are sure to take effect immediately. While we're at it, they may as well both have infinite durations. The result is a pair of low-level commands that start and stop sounds directly - equivalent in fact to POKEing tones on and off in a Vic-type system, but with the advantage that envelopes

can be added without losing their ability to fade sounds in (in response to the 'on' SOUND) and out again (when the 'off' SOUND is sent). Here's a demonstration:

```
10 REPEAT
20 REPEAT UNTIL INKEY(-74)
30 SOUND &11,-15,100,-1:REM on
40 REPEAT UNTIL NOT INKEY(-74)
50 SOUND &11,0,0,-1:REM off
60 UNTIL FALSE
The tone plays while the RETURN key is held down.
```

A musical keyboard

This scheme of direct sound control is exactly what we need to implement a musical keyboard instrument using the Beeb's keyboard, and Program 2 is such an implementation. It uses qwerty row of keys as the white notes, and the row of number keys as the black ones, giving a range of just over two octaves. As Fig 2 shows, the keyboard is displayed on the screen with a marker showing the key being pressed. The keyboard is monophonic (single-voice) with a last-note priority system. As well as manual playing, the instrument can record from the keyboard, and play back at a different rate and/or in a different key. In edit mode, the recording can be played note-by-note, forwards or backwards, and notes can be altered, inserted or deleted. CAPS LOCK must be on when using the instrument.

The instrument has four modes, selected by the first four function keys. PLAY mode is for normal playing. In RECORD mode, the sequence of notes and rests is recorded, wiping any previous recording when the first note is played. Selecting REPLAY mode replays the last recording, even if already in REPLAY mode. The current pitch and tempo modify the replayed recording. The pitch value is the transposition in semitones, normally at zero for straight replay. The H and L keys respectively raise and lower the pitch. 'Tempo' controls the speed of replay, setting the ratio of replay to record tempo. The F key speeds up the replay, and the S key slows it down. Hitting ESC during a replay aborts it.

In EDIT mode, the position of the edit point in the recorded sequence is displayed at the right of the screen (in REPLAY and RECORD modes, this shows the number

of the last note, for reference when editing). Pressing RETURN key plays the note (or rest) at this position. The < and > keys move on and back one note respectively, playing the new note. Playing any note on the keyboard inserts it before the edit point (pressing the space bar inserts a rest) and DELETE removes the previous note or rest. The duration of any note or rest can be changed by pressing the COPY key. This sets it to the value of the current duration (displayed under REPLAY), which can be altered with the L (longer) and S (shorter) keys. The current duration is updated whenever a note is played. Attempts to move or delete past either end of the recording gives a high-pitched bleep.

Key functions

Here's a summary of the key functions:

f0	PLAY
f1	RECORD
f2	REPLAY
f3	EDIT

In PLAY, RECORD, and REPLAY modes:

L	Lower replay pitch
H	Raise replay pitch
S	Slow down replay
F	Speed up replay

In REPLAY mode:
ESC Abort replay

In EDIT mode:

RETURN	Play note
<	previous note
>	next note
DELETE	Delete previous note
Keyboard	Insert before note
COPY	Change note duration
S	Shorten current duration
L	Lengthen current duration

As the listing shows, the bulk of the program is concerned with display, and decoding and acting on command keypresses. This includes all the procedures, from line 1770 onwards. The section that handles the keyboard and sound in PLAY mode lies between lines 920 and 1030 (the keyboard is handled separately by the different modes, with the others following the same general scheme as PLAY). This is the bit we are really interested in, since it can be lifted out and used as the basis of other instruments.

The basic job of the keyboard-to-sound section can be broken down as follows:

```
REPEAT
Wait for a key depression
Derive the pitch for the note
Start the note playing
Wait for the key to be lifted
Terminate the note
UNTIL FALSE
```

This would work but suffers from the disadvantage that while a key is held down, all other keypresses are ignored. To get the last-note priority effect, the program must play the new note even if the last pressed key is still down. To check for new keys and release of the last pressed key at the same time, the set of instructions must be

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repeated continuously, taking action when either of these events arise. The scheme becomes:

REPEAT

IF new key pressed

THEN Terminate last note

derive pitch

start note playing

IF last key released

THEN terminate note

UNTIL FALSE

By making the SOUND statement that plays the note a flushing one, any note already playing is automatically ended, and, as before, a silent flushing sound is used when a note finishes normally, with release of the key.

The program uses the INKEY function to communicate with the keyboard. INKEY(0) returns the ASCII code when a key is pressed, and this is converted into a pitch value by the same method used in the Music Interpreter — INSTR finds the position of the character in the data string 'keys\$'. The other end of the process uses INKEY(-ve number) to find whether the key is still down. The pitch value is converted into the code that identifies the particular key by a look-up table (kc%), and

INKEY(-code) returns FALSE if the key has been released.

The REPLAY and EDIT modes use the SOUND statement in the same low-level on-off fashion, but controlled by timing loops. An infinite-duration flushing sound starts each note, and after a timed delay, it is ended by the next one. Basic's TIME has a resolution of 10ms, so timed loops give better-resolved note lengths than does the SOUND duration facility.

Conclusion

The Music Interpreter and Keyboard Instrument clearly demonstrate an important difference between two types of sound-generating program, in which:

1. The overall program timing is governed by the sound timing.

The program is forced to wait for the current sound to complete before its next sound request will be accepted by the operating system. It runs normally between requests, but overall rate of execution is limited by the rate at which its sound requests are dealt with.

Nearly all sound-only programs, including music players and pure sound-effects

generators, are of this type. Since they have nothing to do but generate sound requests (and make attendant calculations), it doesn't really matter that they are halted for most of the time. They rely on the SOUND duration parameter and queuing system.

2. The overall sound timing is governed by the program timing.

The program runs continuously, making sound requests in response to timed events, user input etc. The program is never held up when making a sound request because it never overloads the OS. This is ensured either by program logistics (there are never enough requests of sufficient duration made in a short time), or by flushing the queues at every request (the program taking part or full control of duration as well as starting time).

Musical keyboard programs and games (applied sound-effects generators) are of this type. They use infinite duration and flushing.

David Ellis and Chris Jordan are the authors of 'Creative Sound on the BBC Microcomputer' — a forthcoming book and cassette from Acornsoft.

END

```

10 REM Recording Keyboard Instrument
20 REM Creative Sound on the BBC Microcomputer
30 REM Acornsoft (C) 1982
40
50 *KEY0a
60 *KEY1b
70 *KEY2c
80 *KEY3d
90 DIM kc% 50, kp% 25, kx% 25, mx% 4
100 DIM dur% 256, pitch% 256
110 PROC keys
120 keys$="abcdLH$F, . "+CHR$127+CHR$135+CHR$13+
"
130 keys$=keys$+CHR$99+"QWZ$ERSTYU7Y90P@^_ \ " +
CHR$136+CHR$139+CHR$138
140 kx%=4:ky%=14:ox%=2:oy%=4
150 px%=2:py%=8:mx%=8:ID130B00
160 black%=CHR$887+
"
2 3 5 6 7 9 0 ^ \ c "+CHR$897
170 white%=CHR$887+
" Q W E R T Y U I O P @ _ \ c "+CHR$897
180 notes$="B C D E F G A B C D E F G A B C"
190
200 DATA 0, 2, 3, 4, 5, 6, 8, 9, 10, 11, 12, 13, 14
210 DATA 16, 17, 18, 19, 20, 22, 23, 24, 25, 26
220 DATA 27, 28, 30
230 DATA separator
240 DATA 97, 17, 50, 34, 18, 35, 52, 20, 36, 53
250 DATA 69, 37, 54, 38, 39, 55, 40, 56, 72, 25
260 DATA 57, 121, 41, 26, 58, 42
270
280 FOR ix=0 TO 25:READ kp%:ix=NEXT
290 READ sep%
300 FOR ix=0 TO 25:READ kc%:ix=NEXT ix
310
320 ON ERROR GOTO 02700
330 *FX11
340 *FX4, 1
350 MODE7
360 VDU23:10, 32;0;0;0;
370 PRINT TAB(0, oy%-1)CHR$897:CHR$897:CHR$897
380 PRINT TAB(ox%, oy%-2)
" f0 f1 f2 f3"
390 PRINT TAB(ox%, oy%):" PLAY "
400 PRINT"RECORD REPLAY EDIT"
410 PRINT TAB(px%, py%)
" Pitch Tempo Dur. Note"
420 PRINT TAB(0, ky%-2):
430 VDU87, 80D0A:897, 80D0A;
440 VDU87, 88D, 80D0A:897, 88D, 80D0A;
450 VDU87, 80D0A;
460 VDU87, 88D, 80D0A:897, 88D, 80D0A;

```

```

470 VDU87, 80D0A:897
480 PRINT TAB(kx%-2, ky%-2)STRING$(35, CHR$8F0)
490 PRINT TAB(kx%-2, ky%+6)STRING$(35, CHR$8A3)
500 PRINT TAB(kx%-2, ky%-1)STRING$(7, CHR$8B5+
CHR$8+CHR$10)
510 PRINT TAB(kx%+32, ky%-1)STRING$(7, CHR$8EA+
CHR$8+CHR$10)
520 FOR ix=0 TO 1
530 PRINT TAB(kx%-1, ky%+ix)black%
540 PRINT TAB(kx%-1, ky%+3+ix)white%
550 NEXT
560 PRINT TAB(kx%, ky%+8)notes$
570
580 dd%=30:tr%=0:item%=10:prev%=-1
590 pitch%?1=255:dur%?1=0:dur%?2=0
600 mode%=0:ix=0:down%=FALSE:PROCmbon
610 PROCcp:PROCpd:PROCpn
620 *FX15, 1
630
640 REM Main Loop
650 REPEAT
660 key%=INSTR(keys$, CHR$INKEY(0))
670 IF key%=0:GOTO 0890
680 IF key%=1:GOTO 0810
690 IF mode%=1:dur%?1=x=0
700 PROCmbon f:mode%=key%-1
710 PROCmbon
720 REM Initialise mode
730 SOUND=11, 0, 0, -1:PROCboff
740 down%=FALSE:prev%=-1
750 ON mode%+1GOTO 0760, 770, 780, 790
760 ix=0:PROCpn:UNTIL 0
770 ix=0:UNTIL 0
780 stop%=FALSE:ix=1:UNTIL 0
790 ix=1:PROCpn:dd%=dur%?1:PROCpd:UNTIL 0
800
810 IF key% 14GOTO 0890
820 ON key%-4GOTO 0830, 840, 850, 860, 870, 870, 870, 870
870, 870
830 tr%=tr%-1:PROCpn:UNTIL 0
840 tr%=tr%+1:PROCpn:UNTIL 0
850 tem%=tem%-(tem%-(99):PROCpn:UNTIL 0
860 tem%=tem%+(tem%-(99):PROCpn:UNTIL 0
870 UNTIL 0
880
890 ON mode%+1GOTO 0920, 1060, 1240, 1380
900
910 REM Play
920 IF key%=0:GOTO 0990
930 px%=key%-15
940 IF down%:PROCboff
950 SOUND=11, -15, px%4, -1
960 PROCbn:down%=TRUE

```

```

970 prevX=PX: CX=-kcX?PX
980 UNTILO
990 IFNOTdownX: UNTILO
1000 IFINKEY (CX): UNTILO
1010 SOUND&11, 0, 0, -1
1020 PROCboff: downX=FALSE
1030 prevX=-1: UNTILO
1040
1050 REM Record
1060 IFkeyX=0: GOT0150
1070 1x=1x+1: PROCpn: 1x=1x-1: PX=keyX-15
1080 IFdownX: PROCboff
1090 IF1x: 253: PROCa: UNTILO
1100 SOUND&11, -15, PX*4, -1
1110 PROCbn: downX=TRUE
1120 durX?IX=TIME: pitchX?IX=prevX
1130 TIME=0: IX=1x+1: prevX=PX
1140 CX=-kcX?PX: UNTILO
1150 IFNOTdownX: UNTILO
1160 IFINKEY (CX): UNTILO
1170 1x=1x+1: PROCpn: 1x=1x-1
1180 SOUND&11, 0, 0, -1
1190 PROCboff: downX=FALSE
1200 durX?IX=TIME: pitchX?IX=prevX
1210 TIME=0: IX=1x+1: prevX=-1: UNTILO
1220
1230 REM Replay
1240 1fstpx: UNTILO
1250 TIME=0
1260 REPEAT: IFdurX?IX=0: UNTIL 1: GOT01340
1270 PROCpn: PX=pitchX?IX
1280 IFPX ( ) 255: GOT01300
1290 SOUND&11, 0, 0, -1: GOT01320
1300 PX=PX+trX: SOUND&11, -15, PX*4, -1
1310 PROCboff: PROCbn: prevX=PX
1320 REPEATUNTILTIME (durX?IX) *temXDIV10
1330 TIME=0: PROCboff: 1x=1x-1: UNTILO
1340 stopX=TRUE
1350 SOUND&11, 0, 0, 0: UNTILO
1360
1370 REM Edit
1380 REPEAT
1390 keyX=INSTR (keys%, CHR$GET): TIME=0
1400 IFkeyX=0: UNTILO
1410 IFkeyX(5): UNTIL 1: GOT0690: teM mode change
1420 IFkeyX(14): GOT01690: REM insert
1430 ONkeyX-4: GOT01440, 1450, 1460, 1450, 1470, 1480,
1490, 1500, 1520, 1650
1440 ddX=ddX-(ddX ( ) 255): PROCpd: UNTILO
1450 UNTILO
1460 ddX=ddX+(ddX ( ) 1): PROCpd: UNTILO
1470 IFFN(-1): GOT01520: ELSEPROCa: UNTILO
1480 IFFN(1): GOT01520: ELSEPROCa: UNTILO
1490 IFFN(-1): XX=1x: CALLdelete: UNTILO: ELSE
UNTILO
1500 IFdurX?IX=0: PROCa: ELSEdurX?IX=ddX: GOT01520
1510
1520 IFdurX?IX=0: PROCa: UNTILO
1530 PX=pitchX?IX: ddX=durX?IX
1540 PROCpd: TIME=0
1550 IFPX ( ) 255: GOT01580
1560 SOUND&11, 0, 0, -1
1570 REPEATUNTILTIME (durX?IX): GOT01610
1580 SOUND&11, -15, PX*4, -1
1590 PROCbn: prevX=PX
1600 REPEATUNTILTIME (durX?IX): PROCboff
1610 SOUND&11, 0, 0, 0
1620 UNTILO
1630
1640 REM space - rest
1650 REPEATUNTILNOTINKEY (-99)
1660 PX=255: GOT01730
1670 IFkeyX=0: UNTILO
1680 REM note key
1690 PX=keyX-15: CX=-kcX?PX: PROCbn
1700 SOUND&11, -15, PX*4, -1: prevX=PX
1710 REPEATUNTILNOTINKEY (CX)
1720 SOUND&11, 0, 0, 0
1730 XX=IX: CALLinsert
1740 durX?IX=TIME: pitchX?IX=PX
1750 PROCboff: DX=FN(1): UNTILO
1760
1770 DEFPROCpd
1780 ex=3: PRINTTAB (pxX+21, pyX+1) ddX
1790 ENDPROC
1800
1810 DEFPROCpp
1820 ex=3: PRINTTAB (pxX+1, pyX+1) trX
1830 ENDPROC
1840
1850 DEFPROCpt
1860 ex=&20103: PRINTTAB (pxX+11, pyX+1) temX/10
1870 ENDPROC

```

```

1880
1890 DEFPROCpn
1900 ex=8: PRINTTAB (pxX+25, pyX+1) IX
1910 ENDPROC
1920
1930 DEFFN (DX)
1940 IFIX=1ANDDX=-1: PROCa=0
1950 IFdurX?IX=0ANDDX=1: PROCa=0
1960 1x=IX+DX
1970 PROCpn=1
1980
1990 DEFPROCa: SOUND&11, -10, 149, 2: ENDPROC
2000
2010 DEFPROCbn
2020 IFPX: 250RPX (0: ENDPROC
2030 xpX=kpx?PX: rowX=1-xpxMOD2
2040 PRINTTAB (kxX+xpX-1, kyX-1+rowX*3) ;
2050 VDU&BC, &AC, &EC, 8, 8, 8, 10, 10, 10
2060 VDU&AD, &AC, &AE
2070 ENDPROC
2080
2090 DEFPROCboff
2100 IFprevX: 250RprevX (0: ENDPROC
2110 xpX=kpx?prevX: rowX=1-xpxMOD2
2120 PRINTTAB (kxX+xpX-1, kyX-1+rowX*3) ;
2130 VDU32, 32, 32, 8, 8, 8, 10, 10, 10
2140 VDU32, 32, 32
2150 ENDPROC
2160
2170 DEFPROCbn: LOCALIX
2180 IFmodeX=10RmodeX: 2msX=6: ELSEmsX=4
2190 PRINTTAB (oxX+mxX?modeX, oyX-1) ;
2200 VDU&BC
2210 FORIX=1TomsX: VDU&AC: NEXT: VDU&EC
2220 PRINTTAB (oxX+mxX?modeX, oyX) ;
2230 VDU&B5
2240 FORIX=1TomsX: VDU9: NEXT: VDU&EA
2250 PRINTTAB (oxX+mxX?modeX, oyX+1) ;
2260 VDU&AD
2270 FORIX=1TomsX: VDU&AC: NEXT: VDU&AE
2280 ENDPROC
2290
2300 DEFPROCboff: LOCALIX
2310 PRINTTAB (oxX+mxX?modeX, oyX-1) ;
2320 FORIX=1TomsX: VDU32: NEXT
2330 PRINTTAB (oxX+mxX?modeX, oyX) ;
2340 VDU32: FORIX=1TomsX: VDU9: NEXT: VDU32
2350 PRINTTAB (oxX+mxX?modeX, oyX+1) ;
2360 FORIX=1TomsX: VDU32: NEXT
2370 ENDPROC
2380
2390 DEFPROCass
2400 FORIX=0TOSTEP2: PX=mcX
2410 OPTIX
2420 .delete \ IX in X
2430 .dloop LDA durX+1, X
2440 STA durX, X
2450 .dout RES dloop
2460 LDA pitchX+1, X
2470 STA pitchX, X
2480 INX
2490 JMP dloop
2500 .dout RTS
2510
2520 .insert \ IX in X
2530 STX &70
2540 .sloop LDA durX, X
2550 BEQ slout
2560 INX
2570 JMP sloop
2580 .slout INX
2590 .lloop DEX
2600 LDA durX, X
2610 STA durX+1, X
2620 LDA pitchX, X
2630 STA pitchX+1, X
2640 CPX &70
2650 BNE iloop
2660 RTS
2670 JNEXT
2680 ENDPROC
2690
2700 IFERR ( ) 17: GOT02730
2710 prevX=PX: PROCboff: PROCbn
2720 stopX=TRUE: GOT0620
2730 ONERROROFF
2740 *FX12, 0
2750 *FX4, 0
2760 VDU23: 10, &72: 0; 0; 0
2770 REPORT: PRINT " at line " ERL " OK?"

```

Program 2

PCW SUBSET

Alan Tootill and David Barrow present more useful assembler-language subroutines. This is your chance to help build a library of general-purpose routines, documented to the standards we have developed together in this series. You can contribute a Datasheet, improve or develop one already printed or translate the implementation of a good idea from one processor to another. PCW will pay for those contributions that achieve Datasheet status. Contributions (for any of the popular processors) should be sent to SUB SET, PCW, 62 Oxford Street, London W1A 2HG.

STANDARDS

It is clear from the letters we get that many of today's Sub-Sets were not around in the pioneering days of 1980, when Sub Set's standards evolved. It is time then for the documentation standards, in their latest form, to be set out again:

1) The first part of the documentation, marked ":", is a label and name to identify the routine.

2) The second part, marked ":", contains a technical description, to enable the routine to be used in a system, without necessarily understanding the code:

Section 1 of the technical description gives the class of the routine. Class 1 routines

are re-entrant (usable by a part of the program interrupting another part of the program that was using it), operate correctly wherever they are located in memory, do not alter their own instructions and return unaltered all registers and flags except those declared as being used to pass information to and from the routine. Other routines are class 2.

Section 2 declares whether or not the routine is time critical.

Section 3 gives a brief description.

Section 4 gives the main actions carried out by the routine.

Section 5 lists any other routines on which the routine depends.

Section 6 gives any input/output interfaces, peripherals or local RAM areas needed.

Section 7 specifies flags, registers, 6502 zero page locations, parameters, stack or other areas assumed to have meaningful values when the routine is called.

Section 8 specifies flags, registers, 6502 zero page locations, and other areas containing results when the routine returns.

Section 9 gives the registers disturbed by use of the routine.

Section 10 gives the maximum number of bytes that could be added to the stack. This includes growth from the routine calling other routines but excludes the two bytes used by the main pro-

gram call for its return address.

Section 11 gives the number of bytes occupied by the routine.

Section 12 is optional for routines not time critical and gives the exact total or maximum number of time states.

Section 13 gives the processor or processors that will run the machine code.

3) The third part is a complete listing of the routine, with assembler mnemonics, comments and machine code.

Sixteen bytes of zero page RAM are reserved for Sub Set 6502 routines. These are referred to as MO to MF in the documentation and mnemonics and as ZZ in the machine code.

6502 ZERO-SUPPRESSED PRINT

Our first contributor this month, Andrew Watson of Stroud, is no newcomer to Sub Set. It was our remarks on zero suppression in November 1980 that prompted Andrew to send, somewhat belatedly, his Datasheet PRAY, which we, more belatedly again, pass on now. This prints out the value, held in binary in the A,Y registers, with leading zeros suppressed, using the stack,

rather than zero page memory, for working space.

It depends on your having your own routine, which is here called CHROUT, to print the character in A at the current cursor position. In the BBC Micro for example, the routine at SFEE3 (their OSASCII) will 'print' the contents of register A on the screen.

DATASHEET

```

: PRAY - Print the value from A,Y
: CLASS: 1
: TIME CRITICAL: No
: DESCRIPTION: Prints the binary value from A,Y as an unsigned
:               decimal number with leading zeros suppressed.
: ACTION: Push 16-bit N and get pointer to it in X
: A = $80
: REPEATS:
: PUSH A
: N = N/10, A = remainder
: UNTIL (N = 0)
: REPEATS:
: Print A as one decimal digit
: PULL A
: UNTIL (A = $80)
: Pull workspace off stack
    
```

```

: SUBR DEPENDENCE: CHROUT, a subroutine to print the ASCII
:                   character in A
: INTERFACES: Suitable output device (printer, VDU or whatever)
: INPUT: Number to be printed in A (MS Byte) and Y
: OUTPUT: The printed number, A = 0, B undefined (could be
:         corrupted by CHROUT)
: REGS USED: A and Y
: STACK USED: 12 maximum, 8 min + n + any stack use by CHROUT
: LENGTH: 49
: TIME STATES: Approx. 44 + d * (48B*execution of CHROUT) where
:              d = number of digits printed
: PROCESSOR: 6502
    
```

```

PRAY:  PHP                25ave             06
      PHA                2registers         48
      TYA                2and              98
      PHA                2get              48
      TXA                2number           8A
      PHA                2on stack,         48
      TSX                2get pointer in X,  BA
      LDA #80            2get terminator,   A9 80
      NXTD: PHA          2push term, or digit, 48
      LDY #16            2set count for 16 dec, A0 10
      SEC                2set A=$80, V=1, C=0, 38
      LDA #0             2                 A9 00
      SBC #80            2                 E9 80
      ROLL: ROL A         2shift hi bit of N into A 2A
      CMP #10            2and subtract 10 if    C9 0A
      BCC NSUB           2required,           90 02
      SBC #10            2if does nothing 1st loop, E9 0A
      NSUB: ROL $102,X    2rotate carry into N 3E 02 01
      ROL $103,X         2and get MS bit.     3E 03 01
      DEY                2do loop            88
      BPL ROLL           2if 17 times,        10 F0
      BVC NXTD           2divide again if N not 0, 50 F6
      ORA #30            2change digit to ASCII, 09 30
      JSR CHROUT         2print int.         20 XX XX
      PLA                2get next digit or term 68
      BPL PRD           2and loop if digit.   10 F8
      PLA                2prestore           68
      TAX                2registers,         68
      PLA                2                 68
      PLA                2                 68
    
```

PLP	RTS	return.	28	60
	RET	; and exit.	C9	
RSTN:	AND	OC7H ; Not a conditional branch;	EE C7	
CP	OC7H	; test for RST (restart)	FE C7	
JR	NZ,JPCC	; If so,	20 06	
LD	A,D	; the required address is in	7A	
AND	35H	; bits 35 of the opcode	E6 38	
LD	H,B	; H = B = zero	6F	
LD	L,A	; L = page 0 address	6F	
RET			C9	
JPCC:	CP	OC2H ; Not RST instruction; check	FE 22	
JR	Z,ABCON	; for absolute conditional	28 10	
CP	OC4H	; JP or CALL	FE C4	
JR	Z,ABCON		28 10	
CP	OC2H	; Not those either; finally	FE C0	
JR	NZ,NOTFR	; check for RET cc. If not,	20 04	
CALL	CTEST	; no transfer; but if so,	CD YY YY	
RET	NC	; test if status. If cc true,	00	
LD	C,RADIS	; treat as RET unconditional.	DE XX	
JR	READR		18 AD	
ABCON:	CALL	CTEST ; Yes, it's JP cc / CALL cc;	CD YY YY	
JR	C,ABS	; if cc true, treat as JP,	38 AB	
JR	NOTFR	; else no control transfer.	18 C5	
; Recover saved contents & return cc true/false in carry flag:				
CTEST:	PUSH	HL ; Save pointers	ES	
LD	HL,AFDIS4	; point to saved	21 XX 00	
ADD	HL,SP	; F register and	39	
LD	A,(HL)	; Fetch into A	7E	
POP	HL	; Restore pointer	01	
BIT	3,D	; If condition asks for	CB 5A	
JR	NZ,TRUE	; flag really, then invert	90 01	
CPL		; all flags	2F	
BIT	5,D	; Use condition bit pattern	CB 6A	
JR	NZ,PRTY	; To rotate the correct flag	20 07	
BIT	4,D	; into Cy	CB 62	
JR	NZ,CARY		20 09	
ZERO:	RLA	; Z or NZ	17	
SIGN:	RLA	; M or P	17	
RET			C9	
PRTY:	BIT	4,D	CB 62	
JR	NZ,SIGN		20 FA	
RRR		; PE or PO	1F	
RRR			1F	
RRR		; C or NC	1F	
CARY:	RET		C9	

DIVISION FOUR

The astoundingly prolific John Kerr, author also of the last Datasheet this month, has sent yet another improvement to SDIV4, the Z80 4-byte signed

integer division routine. This time it shaves one byte off the original which appeared in June 1981 and reduces the execution time from over thirteen thousand to a maximum of 8992.

KEEPING IN TOUCH

Unable to resist the challenges made occasionally in Sub Set, John Kerr of Carmyle has sent NEWPC to complement Bruce Tanner's LENGTH (March 1981).

LENGTH determines the byte length of Z80 instructions and could form the basis of a software single-step program. John's NEWPC provides us with the other essential ingredient — a routine to calculate the contents of the Program Counter

after the next instruction has been executed.

NEWPC suffers from a not inconsiderable number of relative jumps, calls and returns which John typically used to his advantage by setting the routine to test itself.

Instructions affecting the PC are tested for in the following order, with the search being stopped at (6), (8) or (9) if ED, DD or FD is not followed by a valid 'jump' byte.

; STACK USE: 6				
; LENGTH: 184				
; PROCESSOR: Z80				
	AFDIS:	EQU	n1	; The number of bytes above
	BCDIS:	EQU	n2	; the saved registers
	HLDIS:	EQU	n3	; (A,B,C,H,L,X or Y)
	IXDIS:	EQU	n4	; on the stack, including
	IYDIS:	EQU	n5	; two for CALL NEWPC.
	RADIS:	EQU	n6	; The total number of bytes
	; displaced on the stack by the breakpoint routine, from the			
	; original RST n to the CALL NEWPC, including two bytes for			
	; each of these. This is the stack displacement to the			
	; object program 'stacktop', or return address.			
	NEWPC:	PUSH	HL	; Save instruction pointer
	CALL	HL,LENGTH		; & find instruction length
	POP	HL	A,(HL)	; Restore pointer to 1st byte
	LD	A,(HL)		; Fetch 1st byte and
	INC	HL		; point to next
	CP	18H		; If instruction is an
	JR	NZ,DJ		; unconditional branch (JR),
	LD	B,D		; Fetch displacement value in
	LD	C,(HL)		; C and point to 1st byte of
	INC	HL		; following instruction
	BIT	7,C		; Sign extend
	JR	Z,POS		; displacement
	DEC	B		; into B
	ADD	HL,B		; Add into HL to obtain
				; displaced address
	DJ:	CP	10H	; Not JR test for
	JR	NZ,AJ		; DJNZ instruction
	PUSH	HL		; If so, fetch the saved
	LD	HL,BCDIS+3		; B register contents
	ADD	HL,SP		; from the stack
	LD	B,(HL)		; If equal to 1, exit; else
	POP	HL		; treat this as a
	DJNZ:	REL		; unconditional JR
	INC	HL		; Yes, B decrements to zero,
	RET			; so no transfer of control.
	AJ:	CP	0C3H	; Not DJNZ; if instruction is
	JR	Z,ABS		; an absolute unconditional
	CP	OC2H		; JP or CALL, then new PC
	JR	Z,ABS		; 2nd & 3rd bytes of instr
	CP	OC2H		; If unconditional RET,
	LD	BC,RADIS		; then read return address
	JR	READR		; from the stack
	DEOH	HL		; If it's an ED instruction,
	JR	NZ,JPHL		; there is no transfer
	LD	A,(HL)		; unless it's RETI or RETN,
	AND	OF7H		; which are treated
	CP	ASH		; the same as
	JR	NZ,NOTFR		; unconditional RET
	LD	H,B		; Point to
	LD	L,C		; the saved
	ADD	HL,SP		; address
	LD	A,(HL)		; Effectively LD HL,(HL)
	INC	HL		; as HL is pointing to
	LD	H,(HL)		; the desired new PC
	LD	L,A		
	RET			
	JPHL:	DEOH		; If instruction is JP (HL),
	LD	C,HLDIS		; fetch the required address
	JR	Z,READR		; from the stack
	CP	OD0H		; If an index instruction,
	LD	L,C		; there is no transfer
	CP	2,PI		; unless it's JP (X)
	CP	OF0H		; or JP (Y)
	LD	C,(HL)		; which are treated
	JR	NZ,BACC		; similarly to JP (HL)
	LD	A,(HL)		; Fetch 2nd byte of index
	CP	DE9H		; Instructions if JP,
	JR	Z,READR		; read address from stack
	LD	C,L		; No jump; add length of
	DEC	C		; instruction to original
	ADD	HL,B		; contents of HL.
	RET			
	BRCC:	LD	D,A	; Not an index instruction;
	AND	OE7H		; save 1st byte & check for
	CP	2DH		; conditional branch (JR cc)
	JR	NZ,RSTN		; If so,
	RES	5D		; exam F register prior
	CALL	CTEST		; to break, and if condition
	JR	Z,DISP		; true, treat as 'jump'.
	INC	HL		; else step over displacement

DATASHEET

;NEWPC = find PC contents after next instruction is executed
;CLASS: 2 (Not position independent; registers not saved)
;TIME CRITICAL: No
;DESCRIPTION: HL points to an instruction about to be executed in
; 'trace' mode. NEWPC determines the address of the
; instruction which will be obeyed after this one.
; ACTION: Find the LENGTH of the current instruction. If no transfer
; of control will occur, add this to the original HL. Else
; fetch or compute the new PC. See comments for details.
;SUBDEPENDENCE: LENGTH - put length of instruction into C.
; Also local CTEST - set Cy flag if the condition
; specified in an instruction is satisfied by the
; contents of the saved F register; else clear Cy.
; INTERFACES: None
; INPUT: HL points to 1st byte of current instruction.
; OUTPUT: E = byte length of instruction; HL = predicted PC contents.
; AF,BC,D altered.
; REGS USED: AF,BC,DE,HL

(1)	JR disp	18	
(2)	DJNZ disp	10	
(3)	JP addr	C3	
(4)	CALL addr	CD	
(5)	RET	C9	
(6)	RETI/RETN	ED	0100 X101
(7)	JP (HL)	E9	
(8)	JP (IX)	DD E9	
(9)	JP (IY)	FD E9	
(10)	JR cc,disp		001X X000
(11)	RST n		11XX X111
(12)	JP cc,addr		11XX X010
(13)	CALL cc,addr		11XX X100
(14)	RET cc		11XX X000

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VIC CHARACTER BUILDER

The availability of user defined graphics on the VIC is quite well documented (TJ's Workshop January 1983 and July 1982). Basically the VIC normally looks in ROM (a 4K block from 32768 (hex 8000) to 35225 (hex 8999) for the picture of the character). By changing the value held in location 36869 (hex 9005), one of the VIC chip's control registers, it is possible to make the VIC look in another part of memory (either RAM or ROM) for this information (Table 1).

Normally each character is made up of an 8 x 8 dot matrix, but by having a 1 in bit 0 of location 36867 (hex 9003) each character is double height, being made up of an 8 x 16 matrix. In this mode each screen location is twice as big and all characters appear twice as tall (including listings,

etc). The number of rows on the screen must also be changed as 23 double height characters will not fit on the screen.

The number of rows is also kept in location 36867 so to give a screen with 15 rows of double height characters POKE 36867,31 (31 is twice the number of rows plus one). To have this number of rows the vertical centering of the screen must also be changed; this can be done with a POKE 36865,26. There is still a problem, as each character now requires twice the amount of information as for two normal characters — for example, pressing the '@' would result in a '@' being printed above an 'A'.

The way to get around this is to program the letters in the same way as user defined graphics. With normal characters this is done by defining each character with eight 8-digit binary numbers, or denary (base 10) numbers in the range 0 to 255. To

Ordinary



00011000	24
00100100	36
01000010	66
01111110	126
01000010	66
01000010	66
01000010	66
00000000	0

Double height



00011000	24
00011000	24
00100100	36
00100100	36
01000010	66
01000010	66
01111110	126
01111110	126
01000010	66
01000010	66
01000010	66
01000010	66
01000010	66
01000010	66
00000000	66
00000000	66

Fig 1

Value A	Value B	Value C	No Chars	Amount memory used
7168	255	28	32	512
6144	254	24	96	1536
5120	253	20	160	2560
4096	252	16	224	3584

Table 2

get double height characters 16 numbers are needed. This could be done by typing them in DATA statements, but this would take up too much memory as 16 bytes have to be reserved for every character anyway. The other way is to use the characters stored in ROM but instead of using each value once to use it twice.

This short program creates double height characters, reserving enough memory, and can be adapted to define different numbers of charac-

ters, depending on how many are needed and how much memory is available (Table 2). It will work on the unexpanded VIC, on the VIC with 3k RAM expansion or with the super expanded cartridge (in GRAPHICS 0). The screen will work normally after running the program except the computer thinks there are 23 rows although there are only 15, and you can therefore move the cursor off the bottom of the screen.

Andrew McSean

Value in	Characters	Contents of location
36869	start	
240	32768	Character ROM — upper case & full graphics
241	33792	Character ROM — upper case & graphics reversed
242	34816	Character ROM — upper & lower case with some graphics
243	35840	Character ROM — upper & lower case with graphics reversed
252	4096	Start of Basic RAM (unexpanded VIC)
253	5120	Basic RAM
254	6144	Basic RAM
255	7168	Basic RAM

(The above is an expansion of a Table in the Programmer's Reference Guide.)

Table 1

ARTISTIC AID

This program (written in Forth for the Jupiter Ace) allows you to draw your own graphics on the screen, or parts of the screen, & then store each design in the dictionary as your own 'Word'. If you then use that word the previously defined screen is drawn.

The program is fast and easy to use. After typing in the program type in: `SCREEN ONE. A ?` should appear; now enter the code of a character in ASCII — if you want it repeated just keep the enter key pressed. Once

finished enter `ONE` to execute it.

By changing the `DO LOOP` limits you can define parts of the screen — eg. 9952 9824 will store the bottom four lines.

Once you have defined a screen and some parts of screens try writing one on top of the other; some good animations can be achieved. The program is useful for many graphics applications, not just games.

K P Tibbetts

```
DEFINER SCREEN
INVIS CLS 9952 9216 ( Do Loop limits)
DO
  ASCII ? I C! 300 QUERY
  LINE DUP 255 >
  IF
    DROP DUP
  ELSE
    SWAP DROP SWAP DROP DUP
  THEN
    DUP I C! C, ( Store in dictionary)
  LOOP
  VIS
DOES
9952 9216 ( Do Loop Limits)
DO
  DUP C@ I C! 1+
LOOP
```

CBM CRT CONTROL

The later versions of CBM computers, which have 12in screens differ from their predecessors by having CRT control chips which manage the operation of their VDU screens.

The chip fitted is an HD46505 — in some machines, at least. This behaves as if it is equivalent to the 6845, which is often said to be the one used. The workings of the chip are controlled by 19 registers. The first, the address register, may be written to, using the instruction `POKE59520,X`. A value for `X` of zero to 17 directs attention at address 59521 to register `X`. Hence the following instruction `POKE59521,Y` will set register `X` to a new value `Y`.

Most of the registers are best left alone, as they determine matters such as the scanning frequency and screen geometry. Flexibility of these is of benefit when designing hardware, but it is hard to imagine any useful purpose in changing them during normal operation. At switch-on the chip registers are initialised from a table. In the 4000 series the values for registers 17 to 0 are held in addresses 59348 to 59331 and

entered by a subroutine starting at 58903. If, by accident or design, the critical registers become deranged the display breaks up or disappears completely. The CRT heater may even be turned off! Such disasters can quickly be averted by a call to `SYS58903`.

Some of the registers, however, can give useful variations. Register 6 sets the number of text lines which are displayed. This is normally 25, but any lower number has the effect of concealing later lines of text, even though they remain in the screen memory. Thus, `POKE59520,6`; `POKE59521,22` will extinguish the display. Poking increasing numbers to 59521 will then reveal the screen again line by line. A variety of tricks can be played with register 6.

Register 1 has a similar effect in the horizontal direction. `POKE59520,1`; `POKE59521,22` rearranges the format to give only 22 characters per line, giving a simulation of a VIC display. However, the characters are still their usual size and so the picture width is nearly halved.

Registers 12 and 13 control the address of the first character to be displayed (high byte, low byte). The 6845 has 14 address lines for control-

ing this, but only ten of them (A0 to A9) are used for this purpose. Their relationship to the normal display RAM is logical: zero on the lines A0 to A9 causes the display to start at the usual point, 32768. Entering 1 means that the first character in the display RAM is missed and the display starts with the second character from this area. The address lines A10 and A11 are not used. The line A12 is connected to an exclusive OR gate in the path of the video signal which enables the video to be inverted or not at will, by poking 0 to 16 into register 12.

For normal display A12 is required to be high. The ability to invert the video signal is much less useful than one would have hoped: the problem is that, when inverted, all the normally blanked parts of the display become visible. These include extraneous raster area and all the frame flyback path. The highest address line, A13, is connected to pin 18 of the character generating ROM. The ROM normally fitted is a 2048 by 8 bit device, which gives the normal two CBM character sets. Space is available for two extra character sets by fitting a 4096 by 8 bit device. The 2532 PROM has the cor-

rect connections and selection between two pairs of character sets would be available under the control of A13.

Registers 10, 11, 14 and 15 are intended for the management of a cursor. As no connection is made to the cursor output signal, no use can be made of these. Registers 16 and 17 are for use with a light pen. They capture the value held on the address lines at the instant that the strobe input receives a positive-going edge. Pin 21 of the memory expansion connector J4 drives this input, via an inverter. However, pin 21 is also connected to the highest address line of the character ROM, on pin 19. This controls which of the two character sets is in use, giving the odd result that a number is latched into the light pen registers each time that the character set is shifted from upper/lower case to graphics.

Registers 0 to 11 are write-only. Registers 12 to 15 are read/write and the light pen registers, 16 and 17, are read-only. Read/write registers 14 and 15 can be used for storage, but note that registers 14, in common with registers 12 and 16, has only six working bits.

R B D Knight

BINARY CHOP

Searching string arrays for a particular value can be a very time-consuming business. This subroutine (lines 500 to 630) cuts down the search time considerably by using a technique which is sometimes called the 'binary chop'. In this method, which can only be used on arrays already sorted into ascending or descending order, we first look at the string in the middle of the array. This locates the target string in one half of the other and this half is again divided into two and the process repeated until the required string is located or we can decide it is not present. This is a far speedier method than a straightforward sequential search.

The program was written originally as a pro-

cedure for the BBC Computer but has been re-written to suit most varieties of Basic. Lines 30-150 are a short program to test the subroutine, array AS is filled with 676 strings of two characters each in order AA,AB...ZZ, at line 120 the user inputs a two character string and the program prints its position in the array (J%) together with the contents of this position.

The subroutine needs three parameters to be filled: ITEMS must hold the string for which you are searching, S% = start subscript for the search and E% = end subscript for search. After calling the routine F=-1 if the ITEMS was located else F=0, and J% gives the array subscript if the search was successful.

Richard Grubb

10 REM SEARCH PROGRAM TO LOCATE A GIVEN STRING IN A STRING ARRAY. THE ARRAY MUST BE IN ASCENDING SEQUENCE.

```
20 :
30 DIM A$(675)
40 FOR I%=1 TO 26
50 K%=(I%-1)*26
60 FOR J%=1 TO 26
70 A$(K%)=CHR$(I%+64)+CHR$(J%+64)
80 K%=K%+1
90 NEXT
100 NEXT
110 S%=0:E%=675
120 INPUT ITEM$
130 GOSUB 500
140 PRINT J% " A$(J%)
150 GOT0110
160 :
500 F=0
510 TD%=S%+(E%-S%) DIV 2
520 IF (E%-S%)>4 GOT0590
530 I%=S%-1
540 REPEAT
550 I%=I%+1
560 IF ITEM$=A$(I%) THEN F=-1:J%=I%
570 UNTIL I%=E%
580 GOT0630
590 IF I%<A$(TD%) THEN E%=TD%:GOT0510
600 IF I%>A$(TD%) THEN S%=TD%:GOT0510
610 J%=TD%
620 F=-1
630 RETURN
```

BBC DUMP

Here is a short routine I find useful for dumping all programs on a cassette to a printer from a BBC model A or B.

As the LIST command is not allowed from within a program I have programmed a function key to LOAD the next program above this program, to LIST it then jump back to line 80 which puts the code for function key 0 into the keyboard buffer. When the program ends the keyboard buffer is scanned by the OS and function key 0 is

executed. This is repeated until the cassette runs out or ESCAPE is pressed.

This technique can be used to execute other commands from within a program such as NEW, DELETE, etc, which are otherwise 'not allowed'. This operates under OS 0.1 and is not tube-compatible. Users with OS 1.0 upwards can replace lines 80 and 90 with *fx138,0,144.

Peter Middleton

```
5 REM CASSETTE DUMP
6 REM ~~~~~
7 REM P.Middleton, Feb 1983
10 MODE7
20 *FX6,0
30 *KEY0PAGE=%1000:MNEW!MLOAD""1000:ML
IST07:M:BL:M:L:CPAGE=%E00:GOT080:M
40 CLS:PRINTTAB(0,10)"BATCH PRINTER""
Load cassette and set up printer""To ski
p to the next program""press <ESCAPE> the
n f0.""Press space bar when ready"
50 *FX137,1
60 WAIT=GET:CLS
70 *FX137,0
75 REM For OS1.x replace 80 and 90 with
*fx138,0,144
80 ?(%300+%23C)=144
90 ?%23C=?%23C+1
100 END
```

POKE ERROR

There are mistakes in the article 'Poking the MZ-80K' by Anthony Newgrosh, TJ's Workshop of the February issue of PCW.

The filename of a program is stored from locations 4337 to 4353. Locations 4354 and 4355 are for program size. Commands are held from location 5336 to 5649. The last letter of each command has 128 added to its ASCII code. Therefore it can also be changed. For example, POKE 5405,193 will change SAVE to SAVA.

It is not true that POKE 4685, any value will make a sound on printing READY. Only

1,6,8,15,17,19... will make a sound.

For repeat on GET, POKE 10407,0 (184 is for back to normal). Cursor address cannot be changed (POKE does not work). POKE 6350,0 allows "" to be printed (POKE 6350,34 go back to normal). For example: 10 PRINT "He said,

"";POKE 6350,0:PRINT "Good morning!"

20 POKE 6350,34:END Among screen messages, POKE 4857,17:POKE 4858,13 will not print READ but leave a blank line. If POKE 4857,13 instead, it will not even leave blank line.

Ken Chua

BBC INKEY

The machine code equivalent to INKEY on the BBC is described in the User Guide as an OSBYTE call with A=&81. If Y contains a positive number (in two's complement notation), the OSBYTE call is equivalent to INKEY with a positive parameter. The User Guide then says that if Y

contains a negative number, the call can be used to test for a specific key closure (ie, INKEY with a negative parameter), but does not make it clear that Y can contain any negative number and that it is X which must contain the negative parameter corresponding to the key to be tested for.

Glen Slade

OBSCURE 1500 CODE

The long and laborious task of learning about machine code on the Sharp PC-1500 in the absence of a manual on the subject is, perhaps, more interesting than useful, but I have turned up a few things which could be of use. Here are three of them.

ON ERROR GOTO provides a handy means of trapping and dealing with errors, but PC-1500 Basic provides no way of finding what error occurred, or where. This information is obviously vital for programs in which more than one error can occur. After some searching I have found the three relevant locations. PEEK(&789B) gives the error number,

while PEEK(&78B4) * 256 + PEEK(&78B5) returns the line number where it happened.

CALL &CD71 turns the computer off. I'm sure there must be a use for this, but I can't think of one at the moment!

When the novelty of BEEPing wears off, try this program. It provides a sound rather reminiscent of a death-ray (no relation) or a siren.

```
1 REM ABCDEFGHIJ
  KLMNOPQR
3 DATA &5A, &10, &6A,
  &10, &48, &01, &4A,
  &10, &BE, &E6, &6F,
  &62, &99, &06, &52,
  &99, &0F, &9A
5 FOR I = 1 TO 18 :
  READ A : POKE &40C9
  + I, A : NEXT I
7 END
  Line 5 POKES the
  machine code routine in
  line 3 into the REM in line
```

```
40CA 5A 10
40CC 6A 10
40CE 48 01
40D0 4A 10
40D2 BE E6 6F
40D5 62
40D6 99 06
40D8 52
40D9 99 0F
40DB 9A

L1: LSSI CYLCES
LDBI PITCH
LDGI LENGTHHI
LDLI LENGTHLO
L2: JSR BEEP
DECB
BRNZB L2
DECD
BRNZB L1
RTS
```

1 (ZX81 users will be familiar with this technique). Once this has been done lines 3 - 7 are no longer needed, and CALL &40CA will produce the sound. Note that the REM must be the first line in the program for this address to be correct.

For those interested, here is the assembly code:

Anyone with machine code experience should have little difficulty in understanding this.

&40CB holds the number of repetitions of the basic sound effect, and PITCH and LENGTHLO both affect its character — experiment with these.

If anyone else is experimenting with machine code on this machine I would be interested to hear from them.

Malcolm Ray

SHARP HINTS

The Sharp PC-1500 pocket computer has no instructions to position the display cursor *relative* to its current position, but location 30837 holds the cursor value. So GCURSOR PEEK 30837 + n

has the effect of an 'RGCURSOR n' instruction — moving the cursor n columns to the right of its current position. If n is negative, the movement is to the left. This is handy when the 'display length' of an item of output is not known in advance.

Note that if the most recent PRINT, PAUSE or GPRINT statement was

not terminated by a semicolon or comma, the current cursor position will be zero.

Now here's how to recover a program which you've just deleted accidentally, using 'NEW' or 'NEW 0'. The first thing to do is POKE 16581,0 (assuming your first line number was less than 256). At this point, the DEF key can be used to run any suitably labelled part of the old program, but no other method of initiation will work, and the program cannot be LISTed.

In order to fully restore the program, you need to know what its length

(STATUS 1) was. Add this to 16580 (40C4 hex) and convert the result to hex — say you get XYYY.

Now, POKE 30823,XX POKE 30824,YY and the program is back.

If you don't know the length, count four for each line (this takes account of the 2-byte line number, pointer byte and carriage return), two for each reserved word, and one for every other ASCII symbol in the program; finally add one to get the value of STATUS one. Or if you don't have a listing, make a guess at the program length (try to under estimate), add 16580 and PEEK around locations in

this vicinity until you find the byte value 255; its address is the XYYY needed above. Although this search cannot be programmed, as that would corrupt the program you're trying to retrieve, it can be speeded up considerably by the judicious use of a couple of reserve keys.

On the other hand, a suitable machine code program could be stored in the reserve of RAM, as has been done on many other machines. Does anyone out there know when Sharp plans to release the processor instruction set and monitor listing?

Kohn M Kerr

BBC WARP-AROUND

I have found the routine listed below very useful for messages produced by games programs, etc, running on the BBC microcomputer.

Use of the routine instead of the PRINT command will ensure that words are not split between two lines.

The routine as it stands

will accept lines of any length and will cut them down to 40 character lines. The 40 can of course be changed to 20 or 80 for the other modes.

Paul Nix

```
2000 DEF PROCno_split(A%)
2010 LOCAL L%
2015 L%=LEN(A%)
2016 IF L%+COUNT<40:PRINT A%:ENDPROC
2020 REPEAT
2050 REPEAT
2060 REPEAT
2070 L%=L%-1
2080 UNTIL L%<1 OR MID$(A%,L%,1)=""
2090 UNTIL L%+COUNT<=40
2100 PRINTLEFT$(A%,L%-1)
2105 A%=RIGHT$(A%,LEN(A%)-L%)
2110 L%=LEN(A%)
2110 UNTIL L%<40
2120 PRINTRIGHT$(A%,L%)
2130 ENDPROC
```


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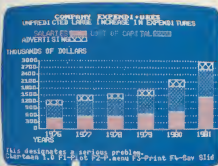
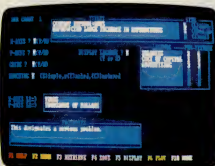
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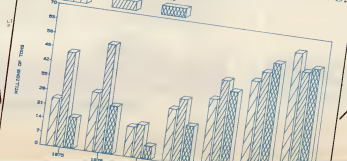
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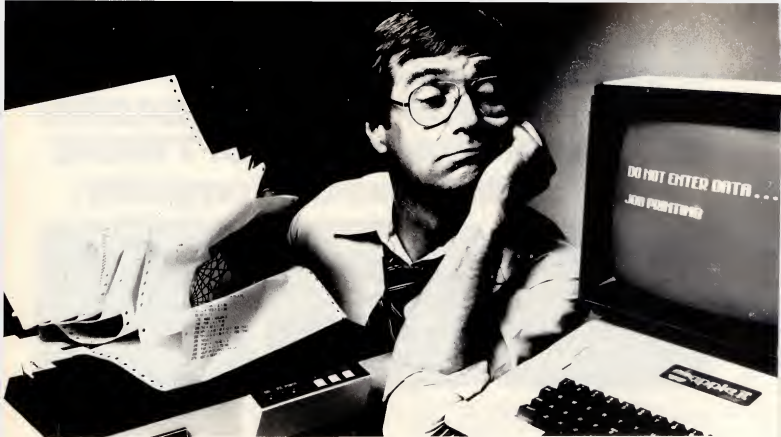


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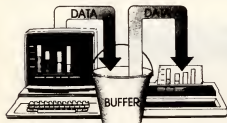
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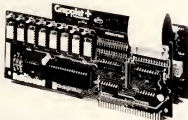
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NEWCOMERS START HERE

This is our unique quick-reference guide, reprinted every month to help our readers pick their way through the most important pieces of (necessary) jargon found in PCW. While it's in no way totally comprehensive, we trust you'll find it a useful introduction. Happy microcomputing!

Welcome to the confusing world of the microcomputer. First of all, don't be fooled: there's nothing complicated about this business, it's just that we're surrounded by an immense amount of necessary jargon. Imagine if we had to continually say "numbering system with a radix of 16 in which the letters A to F represent the values ten to 15" when instead we can simply say "hex". No doubt soon many of the words and phrases we are about to explain will eventually fall into common English usage. Until that time, PCW will be publishing this guide — every month.

We'll start by considering the microcomputer's functions and then examine the physical components necessary to implement these functions.

The microcomputer is capable of receiving information, processing it, storing the results and sending them elsewhere. All this information is called data and it comprises numbers, letters and special symbols which can be read by humans. Although the data is accepted and output by the computer in 'human' form, inside it's a different story — it must be held in the form of an electronic code. This code is called **binary**. Binary is a system of numbering which uses base 2 instead of the more familiar decimal — or, to be more accurate, denary-system of base 10. In binary notation there are only two digits — 0 and 1 — which the computer recognises as the absence or presence of an electric current. The easiest way to visualise this is to think of each binary digit (bit) as being a switch which can be either off or on. Each binary digit stands for a power of 2. The right-most digit, the least significant, is $2^0=1$, the next $2^1=2$, then $2^2=4$, $2^3=8$, $2^4=16$, $2^5=32$, $2^6=64$, $2^7=128$, $2^8=256$. So decimal 24, for example, is represented in binary as 00011000. A set of eight bits is known as a **byte** and, to make things easier for humans, a third system of numbering, hexadecimal or **hex** for short, is used as a sort of 'halfway house' between binary and denary. Hex uses numbers to base 16, with denary numbers between 9 and 16 represented by the letters A-F. The hex equivalent of a byte is obtained by giving each half a single character code: 0=0000, 1=0001, 2=0010, 3=0011, 4=0100, 5=0101 ... E=1110 and F=1111. Our example of 24 is therefore 18 in hex.

To simplify communication between computers, several standard coding systems exist, the most common being **ASCII** (American Standard Code for Information Interchange). This allocates a numerical code to each digit and letter. For example, the number 5 is given the ASCII code 35 hex, 53 decimal, whereas a capital A is represented by ASCII 41 hex, 65 decimal.

The computer processes data by reshuffling, performing arithmetic on, or by comparing it with other data. It's the latter function that gives a computer its apparent 'intelligence' — the ability to make decisions and to act upon them. It has to be given a set of rules in order to do this and, once again, these rules are stored in memory as bytes. The rules are called **programs** and while they can be input in binary or hex (machine code programming), the usual method is to have a special program which translates English or near-English into machine code. This speeds programming considerably; the

nearest the **programming language** is to English, the faster the programming time. On the other hand, program execution speed tends to be slower.

The most common microcomputer language is **Basic**. Program instructions are typed in at the keyboard, to be coded and stored in the computer's memory. To run such a program the computer uses an **interpreter**, which is usually built into the machine's ROM (see later paragraph on this page). The interpreter picks up each Basic instruction, translates it into machine code and then feeds it to the **processor** for execution. It has to do this each time the same instruction has to be executed. A much faster method is to use a **compiler**, which accepts each instruction in turn, waits until the program has been entered, then turns each instruction into machine code before running the program. This means that each instruction has to be translated once only — consequently the speed of execution is considerably improved.

Two strange words you will hear in connection with Basic are **PEEK** and **POKE**. They give the programmer access to the memory of the machine. It's possible to read (PEEK) the contents of a byte in the computer and to modify a byte (POKE). Moving data, this means the physical components of a computer system as opposed to **software** — the programs needed to make the system work.

At the heart of a microcomputer system is the central processing unit (CPU), a single microprocessor chip with supporting devices such as **buffers**, which 'amplify' the CPU's signals for use by other components in the system. The packaged chips are either soldered directly to a printed circuit board (PCB) or are mounted in sockets.

In some microcomputers, the entire system is mounted on a single, large PCB; in others a **bus system** is used, comprising a long PCB holding a number of interconnected sockets. Plugged into these are several smaller PCBs, each with a specific function — for instance, one card would hold the CPU and its support chips. The most widely-used bus system is called the **S100**.

The CPU needs memory in which to keep programs and data. Microcomputers generally have two types of memory, **RAM** (Random Access Memory) and **ROM** (Read Only Memory). The CPU can read information in the stored in RAM, and also put information into RAM. Two types of RAM exist — **static** and **dynamic**; all you really need know is that dynamic RAM uses less power and is less expensive than static, but it requires additional, complex, circuitry to make it work. Both types of RAM lose their contents when power is switched off, whereas ROM retains its contents permanently. Not surprisingly, manufacturers often store interpreters and the like in ROM. The CPU can only read the ROM's contents and cannot alter them in any way. You can buy special ROMs called **PROMs** (Programmable ROMs) and **EPROMs** (Erasable PROMs) which can be programmed using a special device; EPROMs can be erased using ultra-violet light.

Because RAM loses its contents when power is switched off, **cassettes** and **floppy disks** are used to save programs and data for later use. Audio-type tape recorders are often used by converting data to a series of

audio tones and recording them; later the computer can listen to these same tones and re-convert them into data. Various methods are used for this, so a cassette recorded by one make of computer won't necessarily work on another make. It takes a long time to record and play back information and it's difficult to locate one specific item among a whole mass of information on a cassette; therefore, to overcome these problems, **floppy disks** are used on more sophisticated systems.

A floppy disk is made of thin plastic, coated with a magnetic recording surface rather like that used on tape. The disk, in its protective envelope, is placed in a disk drive which rotates it and moves a **read/write head** across the disk's surface. The disk is divided into concentric rings called **tracks**, each of which is in turn subdivided into **sectors**. Using a program called a **disk operating system**, the computer keeps track of exactly where information is on the disk and it can get to any item of data by moving the head to the appropriate track and then waiting for the right sector to come round. Two methods are used to tell the computer where on a track each sector starts: **soft sectoring**, where special signals are recorded on the surface, and **hard sectoring** where holes are punched through the disk around the central hole, one per sector.

Half-way between cassettes and disks is the **stringy floppy** — a miniature continuous loop tape cartridge, faster than a cassette but cheaper than a disk system. **Hard disk** systems are also available for microcomputers; they store more information than floppy disks, are more reliable and information can be transferred to and from them much more quickly.

You, the user, must be able to communicate with the computer and the generally accepted minimum for this is the visual display unit (VDU), which looks like a TV screen with a typewriter-style **keyboard**; sometimes these are built into the system, sometimes they're separate. If you want a written record (**hard copy**) of the computer's output, you'll need a **printer**.

The computer can send out and receive information in two forms — **parallel** and **serial**. Parallel input/output (I/O) requires a series of wires to connect the computer to another device, such as a printer, and it sends out data a byte at a time, with a separate wire carrying each bit. Serial I/O involves sending data one bit at a time along a single piece of wire, with extra bits added to the receiving device when a byte is about to start and when it has finished. The speed that data is transmitted is referred to as the **baud rate** and, very roughly, the baud rate divided by ten equals the number of bytes being sent per second.

The ensure that both receiver and transmitter link up without any electrical hitches, standards exist for serial interfaces; the most common is **RS232C** (or V24) while, for parallel interfaces to printers, the **Centronics** standard is popular.

Finally, a **modem** connects a computer, via a serial interface, to the telephone system, allowing two computers with modems to exchange information. A modem must be wired into the telephone system and you need British Telecom's permission; instead you could use an **acoustic coupler**, which has two obscene-looking rubber cups into which the handset fits, and which has no electrical connection with the phone system — British Telecom isn't so uppity about the use of these.

MS-DOS II

IN SEARCH OF PERFECTION...

Peter Rodwell continues his quest for the definitive micro operating system

Microcomputer operating systems are fast becoming something of an obsession with me. The whole point of microcomputers is that they are cheap enough to allow everyone access to computing power, especially people with no previous formal computing knowledge or experience. In particular, the busy businessman can, in theory, buy a low-cost machine which will help him to become more effective and efficient in his work. All he wants to do is to take the thing out of its box, plug it in and get down to work.

In the present state of things, he can't do this. When he switches on the computer, the first thing he comes across is the operating system — and that's where the trouble starts. To date the only operating system I have seen which even approaches a reasonable degree of user-friendliness is that of Apple's new Lisa. It's not perfect but it has gone much further along that road than any others and shows that Apple at least has a reasonable conception of the requirements of the average business user. Of course the whole effect is quite ruined by its ludicrously high price — about twice what it should be and high enough to prevent it taking off at the mass-market level which the microcomputer industry is all about.

Meanwhile the rest of the world has to make do with what it's given and for many business users this has usually meant CP/M and its derivatives. But the rise of the 16-bit micro has opened the door to new operating systems. These processors have both the power and the memory capacity to use more sophisticated operating systems — ones which are designed to make things easy for the user rather than for the programmer who wrote them. So far, the two major operating systems to emerge for 16-bit computers have been CP/M-86 from Digital Research and MS-DOS from Microsoft. I reviewed and compared these two operating systems in last November's *PCW*. At that time both systems were in their first versions and many facilities which had been promised were not available, such as the 'help' facility for CP/M-86. Both operating systems bore depressing similarities to the original CP/M (now called CP/M-80) and therefore didn't really represent much of an advance towards an operating system fit to be placed before the raw end user.

Recently, however, I was shown a pre-release version of MS-DOS 2, Microsoft's newly upgraded version of its operating system. And a rather strange mix it turns out to be: like the legendary curate's egg, it has some good (ie, user-friendly) parts but the whole system has been steered in what I consider to be a rather dubious direction.

When MS-DOS first appeared it was widely rumoured that, although it looked and behaved very much like CP/M, it was internally a Unix-like system. Unix is a minicomputer operating system designed to make life easier for the programmer. As a software development environment it's very good and has masses of sophisticated features. But it was designed to be used by computer professionals and therefore requires that its users be familiar with various computing concepts and terms. This in turn means that it is quite unsuitable for the computer-naïve user who has neither the time nor the inclination to get his head round computer science. I was therefore rather disappointed to find that MS-DOS 2 had been given a much more Unix-like feel to it; when I compared CP/M-86 and MS-DOS previously, I felt that Microsoft's product was definitely the better of the two as regards its user image. Certainly Digital Research appeared not to have made any efforts at all in that direction. The new MS-DOS retains all the features of Version 1 but a whole host of new facilities have been added. It is still better than CP/M-86 as regards its user image and ease of use for basic operations but the new features are something else.

NEW FEATURES

The major addition is the provision of a 'hierarchical directory' system. This is jargon for a system which allows the user to group files together on a disk, give the group a name and perform various operations — list the directory or move files, for example — using just the group name. But it's a little more complicated than this. The directory system works in a tree-structured fashion, illustrated in Figure 1. The system starts with a 'root' directory which might, for example, contain major program files. You can then proceed to create subdirectories, each containing in turn a list of programs or data files. And these in turn can contain the names of sub-sub-directories. . . and so on.

Having moved down the tree to a particular directory, you can perform tasks on files in other directories using a pathname. As an example, suppose you are in a directory called PETER which contains a directory called FRED which in turn contains a text file called LETTER.TXT on which you wish to work. You would define the path leading to this as PETER/FRED/LETTER.TXT.

Defining pathnames is rather complex (lack of space prevents me from going into the gory details in full here) and really needs the user to maintain a sort of mental map of the disk's directory in his/her head if anything other than the simplest paths are required.

The advantage of all this may not be immediately obvious, especially when you

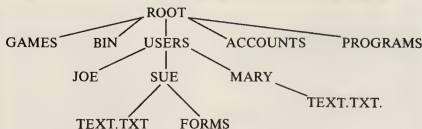


Fig 1 The hierarchical directory structure. The root directory contains directories of programs and files called GAMES, BIN, ACCOUNTS and PROGRAMS, plus a directory called USERS. USERS in turn contains directories called JOE, SUE and MARY. Both SUE and MARY have sub-directories called TEXT.TXT and SUE also has one called FORMS.

Command	Type	Purpose
BREAK	I	Turns on or off the facility for aborting a program by typing Control-C
CAT	E	Sorts and formats a disk directory
CHDIR	I	Changes the current directory in which you're working to another
CHKDSK	E	Displays and optionally fixes inconsistency in a specified directory
CIPHER	E	Encrypts and decrypts a text file, using a user-specified keyword
CLS	I	Clears the screen
COPY	I	Copies one or more files from one disk to another, renaming them if required
CTTY	I	Allows you to change the device used for input and output
DATE	I	Displays and allows you to alter/set the current date. The date and time are automatically included in directory entries.
DEL	I	Deletes specified files from a disk or directory
DIR	I	Displays the files in the current directory if used alone or in another directory if used with a pathname
DISKCOPY	E	Copies the entire contents from one disk to another, over-writing anything on the destination disk
ECHO	I	Normally the commands in a batch file are displayed on the screen as they are executed, but this can be suppressed using this command
EXIT	I	Exits the command processor of MS-DOS and returns to the previous level, if one exists
FIND	E	Searches for a specified text string within a text file or files
FOR	I	Used in batch files to allow loops to be set up
FORMAT	E	Formats the disk in a specified drive and optionally puts a copy of the operating system onto it
GOTO	I	Yes, means just what it says; one of the powerful batch file commands
IF	I	Conditional statement used in batch files
LOCATE	E	Turns '.EXE' (executable) files into binary format, giving faster-running programs and saving disk space
MKDIR	I	Creates a new directory
MORE	E	Sends output to the terminal a screenful at a time and waits for the user to hit return before displaying the next screen
PATH	I	Sets up a command path
PAUSE	I	Suspends the execution of a batch file
PRINT	E	Prints a text file on the printer while you are performing another operation
PROMPT	I	Changes the MS-DOS command prompt
RECOVER	E	Allows you to recover at least part of a file or disk containing bad sectors
REM	I	Allows you to add comments to a batch file which are displayed during execution
REN	I	Renames a file
RMDIR	I	Removes an <i>empty</i> directory from a directory structure
SET	I	A rather esoteric one, this, which allows you to set up one text string as equal to another for use in some applications programs
SHIFT	I	Allows more than 10 parameters to be passed to a batch file
SORT	E	Sorts a file alphabetically or numerically
SYS	E	Transfers the operating system (which actually consists of several files) from one disk to another
TIME	I	Displays and allows you to alter/set the time; like the date, this is added to directory entries
TYPE	I	Displays the contents of a text file on the screen
VER	I	Shows the operating system version number
VERIFY	I	Turns on/off the disk write verify facility.
VOL	I	Displays the disk volume number, if there is one

Fig 2 MS-DOS 2 commands

see how you have to specify which directory you want to work on or move to. In fact on an ordinary, single-user floppy disk system it's more of an unnecessary frill which, I suspect, most users will ignore. It comes into its own, however, on a hard disk system where, as things stand at the moment, asking for a directory listing can result in dozens of file names whizzing up the screen at a fair old rate of knots. It's also useful on multi-user systems, where every user can have his or her own directory — but as I've so often said in the past, multi-user micro systems are pretty pointless.

It's perfectly possible for a user to work with MS-DOS 2 without ever bothering with the hierarchical directory structure and I suspect that this is exactly what most end users will do. For the moment you start to use such a feature, you need to understand fully how it works and that, frankly, is something which many business users will simply not want to take the time to do.

Likewise, the 'pipe' facility may confound many first-time users to the point at which they may never use it. Pipes allow you to automatically use the output of one program as the input of another. A prime example is the SORT utility which comes with MS-DOS 2. As a simple example, you could ask for a directory listing and use SORT to sort it into alphabetical order and put the result into a text file called LIST with the command `DIR : SORT >LIST`. The ':' denotes a pipe which carries the output of the first command or program to the input of the next one; '>' redirects the output of a program, in this case to the file LIST. Using '>>' rather than '>' would append the output to the end of LIST.

SORT is one of a series of features called 'filters' which can be fed with the output of a command or program. Other filters are CIPHER, which encrypts/decrypts a text file, FIND, which will find a text string within a file and MORE, which will display text output on the screen a screenful at a time and wait while you read it.

Pipes are, I feel, easier for the computer novice to understand than the directory structure but again my hunch is that many users won't bother too much with them. Business computing is moving rapidly to the stage-where a computer — to the user — ceases to be a computer and becomes a piece of office equipment to be regarded in the same light as, say, a typewriter or a photocopier; it will be purchased and used with the same attitude as are these pieces of equipment. The trend demands that suppliers sell machines which are ready to perform the desired tasks in response to very simple, easy-to-understand commands. Fortunately, MS-DOS 2 contains excellent facilities to allow the supplier to set up all operations with batch commands.

A batch command is, simply, a text file containing a list of commands. The file name must end with '.BAT' and is activated simply by typing its name as though it were a program. There's no equivalent of CP/M's SUBMIT program, which provides a batch facility but requires you to type SUBMIT ERIC to activate the batch file ERIC.

One batch file name is reserved for special use: AUTOEXEC.BAT. Any file with

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IN SEARCH OF PERFECTION...

this name will automatically start to be executed when the system is turned on or reset, allowing a 'turnkey' system to be established which will automatically start running without any commands being typed in by the user at all. As an example, a file called NEWDISK.BAT could be created containing the following:

FORMAT B:

DIR B:

This would be activated by typing 'NEWDISK' and would format a blank disk in drive B and display its directory.

Up to 10 parameters can be passed to a batch file to allow you to use one batch file

to perform several tasks. Our previous example could be re-written

FORMAT %1:

DIR %1:

and activated by typing NEWDISK A or NEWDISK B, depending on which drive contained the blank disk; the '%1' would then automatically be replaced with 'A' or 'B' throughout the batch file.

A number of other new commands have been added to MS-DOS and I have listed all commands — old and new — in Figure 2. Some of these commands are internal, ie they are built into the operating system and are activated immediately you type in their names, while others are external and take the form of separate programs residing on disk.

This is really a brief overview of MS-

DOS 2 based on a morning spent at Microsoft's UK headquarters watching it being put through its paces. Obviously the first machine to benefit from it will be the IBM Personal Computer and other machines are expected to follow soon. Without wishing to boast, I'm writing this just before setting out to California for the West Coast Faire and visits to a number of companies, including Digital Research and Sirius, where, with luck and/or persuasion, I might be able to see and even pick up Sirius versions of both MS-DOS 2 and Concurrent CP/M-86, thereby getting more first-hand experience of using both in my continuing search for the perfect operating system. I don't think that either will fit this description but we're getting closer and I'll keep you posted.

END

BRAINDUMP

THE NEW ILLITERATES?

The English Language is fighting a losing battle against the computer industry. Steve Mann leaps to its defence...

Just what is it about computers that encourages illiteracy in their users? As someone who comes into contact with a wide range of computer-related products, I am now becoming resigned to the fact that, nine times out of ten, any documentation I receive will be poorly presented, will contain numerous spelling mistakes and, in general, will be of a standard that bears comparison only with the *Guardian* on an off-day.

It can be argued that this is merely a product of the times we live in. It has been said that it would be impossible to write badly in early 17th century English — the language itself was so rich in vocabulary and style that it forced its users to write well. It is undeniable that the English we speak and write today is a devalued currency; meaningless phrases like 'At this moment in time' are used as a sort of verbal shorthand by everyone from trade union leaders to television presenters and generally serve only to conceal an absence of thought. This, of course, is a general problem — just think of the number of advertisements you've seen in magazines and newspapers that feature misspellings, wrongly placed or missing apostrophes and sentences that appear to have been constructed with a random number generator. Indeed, the *Daily Mirror*'s columnist Keith Waterhouse has become so disgusted at the standards prevalent in today's journalism that he has formed a society — the Association for the Abolition of Aberrant Apostrophes (AAAA for short). I am aware that I could find myself in what *Private Eye* would describe as a 'glass houses situation' here — although we do our best to catch typographical errors before *PCW* is printed, we are not always successful; and this is the case with all magazines and newspapers that have a tight production schedule. To a certain extent, this is inevitable: in the best of all possible worlds we

would have time to check, double-check and triple-check each page before it was printed; our publication schedule precludes this, however. But I would submit that this is not the case with the majority of computer-related products; typical documentation of a games cassette, for example, will consist of, at most, a couple of sheets of A4 paper or simply a cassette insert — to read and correct this is a relatively simple task.

It is all too easy to become pedantic on this subject. English is a 'living' language; style and vocabulary change from generation to generation and there are very few hard and fast rules as to what is 'right' or 'wrong' — at least in terms of grammar and construction. But one factor, surely, is of prime importance — clarity of meaning: it is here that sloppy writing and bad presentation can cause the greatest damage.

In the infancy of the microcomputer industry there was some excuse for bad presentation — products were often hastily put together in someone's home or garage, and documentation would consist of a couple of pages of typewritten notes run off on a photocopier. To a certain extent, this is still the case with a wide range of small businesses producing small quantities of original software. But the worst offenders are often those who, in theory at least, have the time and resources to do things properly. Two examples that immediately spring to mind are the documentation that accompanies Quicksilver's 'Time Gate' games cassette, and the new Lisa system from Apple. 'Time Gate' features a complete redefinition of the standard Sinclair Spectrum character set. It is obviously something that entailed a great deal of thought and effort on the part of the program writer and the company, but the effect is ruined by a complete lack of apostrophes and the misspelling of 'possible' as 'possable'. Apple, despite spending three man-millennia on

the development of Lisa, managed an elementary spelling mistake that remains on the screen for most of the time the system is in use (see March *PCW*). I find it difficult to believe that those responsible can expend so much time and effort on presenting their product to the best of their ability, yet still do not see the need to consult a dictionary.

All this, of course, does not even take into consideration the educational aspect. I am sure that many teachers would throw up their hands in horror at some of the examples to be found in software documentation. The long-term effect can only be bad for general educational standards — after all, if a child is continually confronted with a piece of documentation that is riddled with errors, the tendency will be to suppose that the mistake is, in fact, the correct way to spell or punctuate. Children can only learn by example — if you constantly present them with information that is incorrect, the chances are that they will grow up believing this information; and it's going to be that much harder for teachers to correct them.

The advent of computers forced changes to the English language — suddenly we were confronted with strange new spellings of words like 'disk' and 'program'. In most cases this served to remove any ambiguity; we now have a convenient way of distinguishing between a television programme and a computer program, a record disc and a floppy disk. It's a pity that the other legacy of the computing revolution seems to be a feeling that grammar and spelling don't really matter. I think they do — syntax is extremely important in computer languages and I can't see any reason to ignore it in English. Our native language, after all, is extremely well documented and there is a much-revised, extremely accurate user manual. It's called a dictionary — and I think we could all consult it more frequently...

END



PORTABLE COMPUTER WORLD

SHIRT POCKET CASIO

Dick Pountain takes a close look at the latest pocketable computer — the Casio PB-100

At the top end of the portable computer market all is chaos. Osborne has spawned a host of lookalikes too numerous even to remember their names. In the middle, Epson has opened up the "book sized" market and others like TI and NEC are following. But the bottom end (pricewise) of the market is still dominated by a silent struggle between two companies, Sharp and Casio. I hesitated before saying "bottom" end because in many ways these machines are in the vanguard, attacking problems of miniaturisation which their bigger rivals are for the moment avoiding by using standard micro industry parts. But if the future really does lie in a "pocket mainframe" then the technology which Sharp and Casio are putting into machines like the 1251 and the PB-100 is pioneering stuff; despite which many people will still regard them as glorified calculators.

The latest round in the war involves the almost simultaneous launch of the Sharp PC-1251 (reviewed in March) and Casio's PB-100, the subject of this review. Both machines are basically scaled down versions of previous models which, by using very Large Scale Integration, have retained all the functions of their predecessors in a much smaller, more attractive, package and at a reduced price. The PB-100 is a replacement for the fx702p which is currently being sold off at a discount to clear stocks.

Hardware

The PB-100 comes in a slim alloy and plastic case measuring 163×70×10 mm which makes it rather longer than the Sharp but equally "shirt-pocketable". Despite its extra length it has a smaller display, which holds 11 characters on a 7×5 dot matrix. At the top of the display are several small character annunciators for the different operation and angular modes and to display the number of program steps remaining.

The keyboard is completely redesigned in qwerty layout (the 702p was abcd alphabetic) and has nicely spaced keys; like the Sharp however it lacks a proper space bar, space being hidden among the other keys. The idea of single keystroke Basic reserved words is retained from the 702p; each main key has in fact four functions, the second two being obtained by entering EXTension mode. Normally shift will produce a Basic word — eg, shift A gives GOSUB — but in EXT mode one gets lower case letters which shift to

special graphics characters including some Greek letters. The equivalent of Enter or carriage return is a large key called EXE which lives in the numeric keypad. This is very convenient as it allows the PB-100 to be used as a calculator with only one hand.

The 702's CONT key is gone; now we have a STOP key which suspends program execution and EXE restarts it. The ANS key is retained which recalls to the display the result of the last calculation performed even if the power has been switched off in the meantime. MODE, shift and cursor left and right are placed in their own small pad above the main keys. Ten modes of operation are provided, namely RUN, WRT, EXT, trace on and off, print on and off, and three angular modes.

A peep inside the case (easy for once as screws are used for fastening) reveals the true achievement in integration as processor, RAM and Basic ROM are all on a single chip about half the size of a postage stamp. In addition an interesting new kind of flexible cable is used for bus connections which appears to have black plastic conductors instead of metal! Two lithium cells provide 360 hours continuous operation which translates into around two years of normal use. Next to the battery holder is space for an extension RAM module which was fitted to the test machine. The standard RAM fitted is 544

steps plus 26 memories (ie, variables), which adds up to 752 bytes since the Basic is fully tokenised. The extra RAM pack adds a further 1k to give 1568 steps and 26 memories. The memory is repartitionable using the DEFM command; one could have 94 memories (222 with RAM pack) and no program space. This is quite substantially less memory than is offered by the Sharp 1251 which comes with 3724 bytes of user memory as standard.

A glance at the Benchmark timings will show that this processor is fast for an ultra-miniature CMOS device; up to 5 times faster than the PC1251 on certain functions.

It goes without saying of course that the PB-100 is all CMOS with permanent memory and auto power off after seven



Printer cradle is in two parts and is rather fiddly.



Whole system is briefcase size.



Benchmark timings

BM1	8
BM2	39
BM3	82
BM4	80
BM5	105
BM6	160
BM7	220
BM8	341

All timings in seconds. For a full explanation of Benchmarks see PCW November 1982.

minutes. As is now the fashion, a somewhat redundant contrast control is fitted. There is no real time clock/calendar function.

Operation

The PB-100 works very nicely indeed as a calculator due to the thought which has gone into the user interface. Chained calculations are performed exactly as they would appear on paper with the added benefit that the display can be edited using the cursor (pressing ANS once in the middle of a calculation puts the editing cursor on the display; hitting it again recalls the last result calculated). When using functions like SIN and LOG no parentheses are required around the argument which saves a lot of fiddling with shifted characters. Arithmetic is to 12 digits with 10 displayed (8 if an exponent is used); dynamic range is the usual $10^{\pm 99}$. Two numeric formats are supported; fixed point scientific (selected by SET E n) or floating point (SET F n) with rounding to n digits on the display only; SET N cancels any format and the full 12 digit numbers are available internally. Scientific format (eg, 1.3456E24) is automatically selected for numbers above 10^{10} or below 10^{-3} . All the transcendental functions normal to Basic are supported but the extra statistical functions of the 702p have regrettably been abandoned; they must

The no-frills basic model.

be entered as a program if required.

In other respects the Basic and operating system follow closely that of the 702p; 10 program areas called P0-P9 can be selected to hold separate programs and can be saved individually or all together on tape using the optional FA-3 adaptor. The Basic offers fairly spartan but useful facilities; in particular the only string functions are MID (for extracting a substring) and VAL (string to numeric conversion) and the former only works on the special 30 character variable \$\$. All other string variables are limited to seven characters. The variables are allotted as A-Z or A(0) to A(25) etc; B(0) is the same variable as A(1) and so on. When using subscripted variables as arrays (they don't need to be dimensioned) it is possible for them to overlap with disastrous consequences if you don't watch out.

An irritating omission is the absence of any kind of programmable WAIT for the PRINT function; animated displays are difficult to achieve as PRINT will normally stop execution until EXE is pressed. No machine level interface via PEEK and POKE is available either.

On the plus side, the control structures are quite rich with full computed GOTO and GOSUB either to a line number or to a separate program area. Proper data files can be constructed using PUT and GET which write the contents of a single variable or a contiguous block of variables to tape.

A new thermal printer, the FP-12, is designed to go with the PB-100. It is incorporated in a cradle which holds the computer unlike the older FP-10 which hung on via a cable. The cradle is in two pieces which snap together and seems rather overcomplicated for the job it does. The printer uses 20 columns and puts out a line every second; it runs off internal rechargeable batteries but there is still a drain on the PB-100's own batteries which will last for 40 hours of continuous printing. Printing from a Basic

program is performed by selecting and deselecting print mode; there is no LPRINT statement so every print will look like:

300 MODE 7 (switch on print)

400 PRINT A,B,C

500 MODE 8 (switch off print)

though multistatement lines are permitted and will save a few bytes. MODE 7 can be selected manually from the keyboard to give hard copy for calculations.

Documentation


The PB-100 user manual is the normal flimsy affair produced by Casio but is nevertheless quite complete and better translated on average than some previous ones. However the PB comes with a sizeable paperback book as well, called 'Learn as you go' which is a useful step-by-step Basic tutorial and includes a small program library at the end. It is illustrated with cutesy cartoons in the Japanese manner and is quite readable, if slightly stilted in prose style.

Prices

Casio PB-100	£59.95
1k RAM pack	£13.95
FA-3 Cassette adaptor	£25.95
FP-12 Thermal printer	£54.95

Conclusions

The PB-100 is one more nail in the coffin of the programmable calculator; it provides all the facilities offered by the older calculators in a smart and compact package and is much easier to program. It has a lot less memory and a less powerful Basic than the Sharp PC1251 but then it is cheaper to buy (though the gap narrows once you add in the RAM pack). It is very significantly faster than the 1251 which for applications involving long iterative computations could be crucial.



SOFTWARE DATABASE BENCHTEST

MICROPEN

Intelligent Software (Ireland) has produced a set of related CP/M packages. Here, Kathy Lang takes a look at MicroPen, a menu-driven database system. See also her review of MicroScript in this issue.

MicroPen, one member of a family of CP/M-based packages recently launched by Intelligent Software (Ireland), is probably the simplest and certainly the cheapest of the packages I've reviewed in this series. I thought it would be interesting to see how such a program performed against its bigger and more expensive brothers, so the major question I wanted to answer was — what do you get for £140, and is what you get enough for a serious data management application?

MicroPen is menu-driven but keeps its menus short so that they can be displayed at the top of the screen with any record currently shown. The package expects all its records to have a fixed format, with fields of fixed length. You must design just one format for each data file, but the format is extremely flexible. If you wish, you may specify a single field as the key on which the record is to be indexed; the specification of the key field is part of the input record format, but you can change it after the data file is set up if that becomes appropriate. Recall is by key field, record number or selective search. Printed reports of great variety can be used to provide circular letters, address labels, client record 'cards', what you will. There are no facilities within MicroPen for calculation (rather unusually, this *is* provided with Pen's sister package for word processing, MicroScript), nor for sorting. MicroPen can handle only one file at a time and doesn't provide any house-keeping facilities within the package.

Script', but I used Wordstar just to prove that it is possible to use another word processing package. I didn't have any problems provided I used the non-document create option, as MicroPen dislikes format file which have the high-order bit set — and Pen does warn you about that.)

The ease of creation therefore depends on the facilities of your friendly word processor. With a good package it should be easy to 'paint-a-screen' giving any format you require. MicroPen has three conventions here. Each field is delimited by two symbols — square brackets are used unless you instruct the system differently — separated by enough character positions to hold the desired length of field. The first character within the brackets is a symbol which will be used to identify the field in report formats, and the remaining characters are spaces. The third convention concerns the first line of the format: if the file is to be indexed, this line is used to specify the key

field and the maximum number of records to be stored, otherwise it must be blank.

Apart from these conventions, the user has complete freedom as to what the rest of the format contains. So you have control over what captions are displayed and what field placing is used. A typical screen format is shown in Figure 2. Screen formats may be changed, to the extent that anything outside the square brackets may be moved at will. Fields can be renamed and also moved to different positions to some extent, provided the *sequence and length* of fields are maintained. The name of the key field

Max file size	disk size
Max no records	32750
Max size record	1024
Max no fields	100
Max field size	Screen width-2-
	caption length (if any)
Field types	Character

Fig 1 Constraints

: Title [A]	: Initials [R]	: Surname [C]
: Address1 [D]		
: Address2 [E]		
: Address3 [F]		
: Address4 [G]		
: Advantages [H]		
: Product [I]		
: Container [J]		
: Vouchervalue [K]		

Fig 2 Typical screen format

Constraints

The constraints on data are shown in Figure 1. Probably the most significant constraint is the restriction to a single screenful of information — and in fact to 21 lines of the screen, as MicroPen uses the top line for instructions to the user.

File creation

The first step in creating a data file is to set up the input format. This is done not in MicroPen itself but in a word processing package. (The manual says 'such as Micro-

: Title Mrs]	: Initials B.M.]	: Surname Pasmore]
: Address1 The Brock		
: Address2 Piper's Lane		
: Address3 Haverage		
: Address4 Hampshire		
: Advantages cleansing powers		
: Product Sudsy Soap Flakes		
: Container packet		
: Vouchervalue 20p		

Fig 3 Record displayed in Fig 2 format

and the number of records to be indexed can also be changed after the data file has been set up, but only if the change is followed by the re-organise option, which takes quite a long time. Benchmark 6 shows the time for my 1000-record Benchmark data file.

Data input and updating

The format used for data entry, set up when the data file is created, is used for all interactive screen display and recall of the data. When you are adding records to the data file, or amending records which already exist, you simply use the cursor keys to move about the screen, using MicroPen as a simple screen editor. Functions are provided to move up and down by line or field and left and right by character or field. You can delete single characters or complete fields. Editing is circular — if you press the 'next field' key at the end of the last field, the cursor moves to the top of the record again. I found that a bit unnerving, especially as, like a lot of keyboard artists, I don't look at the screen all that often. When you tell MicroPen you have finished editing that record, you are given the option to make further changes, abandon the record altogether or store it as it is — all pretty obvious, you'd think, but it's surprising how few packages give you the option to correct that error you notice just as you've pressed the 'finished editing' key...

Screen display

MicroPen uses the same basic format for all interactive screen display. Figure 3 shows an example of a record displayed using the screen format given in Figure 2. You can ask to see records by number, by search, by key, or by listing all the records in the file. If you ask to look at all records, then you can have them shown either with a pause after each record, or continuously. With key display, you are asked to give the value of the key field that should be matched: an exact match is then sought. If one or more matching keys are found, MicroPen lists each key value with the associated record number (up to 20 records on the screen at a time). You can then ask to see the particular record(s) from the list. This is of course an alternative to the more common approach of allowing you to browse through all the records with a particular key. Which is better depends very much on your purpose in retrieving the record.

Printed reports

All printed reports in MicroPen are based on individual records — there are no facilities for totalling, for instance. The format of a report is dictated by a pro format stored in a file but, unlike screen display, there may be many different report formats for each data file. These formats are created outside MicroPen by a word processor. The flexibility of the report procedure is probably the most unusual feature of MicroPen. You can include field names anywhere in the report, and surrounding text may be captions or prose. If you include field names in variable text,

```
PAGESIZE=72 STARTLINE=10 ENDLINE=65 PAGEWIDTH=78 MARGIN=10 ACROSS=1
[A [R [C,
[D,
[F,
[G,
```

January 18th 1983

Dear [A [C,

I am sure by now you will have heard of the great [H of [I. In case you have not yet had a chance to try this miracle product, I am enclosing a voucher to enable you to purchase your first [J for [K off the usual price. We look forward to having your custom for many years to come.

Yours faithfully,

L.R. RLOGES,
Marketing Manager, Sudsy Soap Powders Plc.

Fig 4 Typical report format

Mrs R.M. Pasmore,
1, The Brock,
Piper's Lane,
Haverage,
Hampshire.

January 18th 1983

Dear Mrs Pasmore,

I am sure by now you will have heard of the great cleansing powers of Sudsy Soap Flakes. In case you have not yet had a chance to try this miracle product, I am enclosing a voucher to enable you to purchase your first packet for 20p off the usual price. We look forward to having your custom for many years to come.

Yours faithfully,

L.R. RLOGES,
Marketing Manager, Sudsy Soap Powders Plc.

Fig 5 Fig 3 data printed with Fig 4 format

such as a paragraph in a letter, MicroPen reformats the paragraph to make the text fit within the specified margins. Figure 4 shows a typical 'report' consisting of a letter with some variable information, represented by the left square brackets and the letters which follow, to match with fields from the data file. Figure 5 shows how the final result would look, if this format were used to print information from the record shown in Figure 3.

In this example the text is shown printed with a 'ragged right' margin. If you have a printer which can print using 'microspace justification' (which seems to mean proportional spacing in this context) you can if you wish have the text printed flush to both margins — 'right justified' in the jargon of the word processors. Among the other printing controls are page and line size, and also 'across', a parameter which allows you to print labels which are mounted two, three or more across the page.

Selection

In addition to selecting records by number, or by key field and thence by number, you can also set up a search sequence. You can request a match on any field or all of them; if you request a match on more than one field, the requests are combined (ANDed) so that records are selected only if they satisfy all the criteria. You can select only one value from each record; that selection

may request that the value equals the test value, is not equal to, contains, does not contain, is less than, is greater than. (The last two can be used only to match numeric fields — you can specify them for any field, but they don't work for fields which contain letters.)

To allow you to make your selection, MicroPen displays the record display format on the screen, and allows you to indicate both match type and value against each field. Match type is indicated by pressing a control sequence; for instance, in the supplied version of MicroPen, CTRL-Q indicated 'contains'. Prompts are displayed on the top of the screen to remind you which control character to use but, unfortunately, there isn't room on the display format itself to print a representation of these control characters, so MicroPen uses numbers instead. These are allocated in the order the control characters appear in the prompt list, so CTRL-Q is shown in the record itself as 1, for instance. I found this rather muddling — personally I would have preferred some convention which allowed me to see displayed the character(s) I'd pressed. You could use the tailoring provisions to change this.

Tailoring

An unusual feature of MicroPen is that the user has complete control over all the prompts, as well as over the terminal and

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printer controls. All the instructions needed by the program are kept in a plain text file, called the command file, which can be altered by the dealer or even by the user, either with a text editor or with the REPAIR utility supplied with MicroPen. I changed mine quite a bit to make use of the function keys on our Sirius; the resulting command file is shown in Figure 6. So it would be quite easy not only to change the control sequences but also to supply prompts in other languages — presumably the EEC is the spur for this. The control sequences include all the usual cursor movement keys, a provision omitted by quite a number of the more expensive and powerful packages.

Security

MicroPen doesn't have any features to allow you to prevent unauthorised access to data. However, it does provide a 'write lock' feature to allow you to use the package in a multi-user environment. If one user has a file open for entering new records or for updating, the file is locked for writing; other users may recall records to inspect them on the screen, or to print reports, but may not add or change information.

Reliability

MicroPen takes some precautions against crashes by storing information in blocks of 4098 records per file; files are automatically linked together by the package, so users don't have to worry about this. (This also means that total file size is not restricted to the usual CP/M limit of eight Megabytes; if you wanted to, and if your disk were large enough, you could have 32,750 records each of 1024 characters!)

I didn't have any problems with lost data but I did manage to invoke the record locking feature by mistake on several occasions. For instance, when the file is first set up, if you want it to be indexed you must specify the maximum number of records it is to contain. When I tried to add an extra record to a file which already contains its maximum number of records the system stopped dead with no message; on reset, I found the file was locked against me. Unlocking is, however, a simple matter — you just invoke the 'repair' utility to reset the lock, a facility which could also be essential when several users have access to the same file. The 'repair' utility also allows you to carry out some other 'mends' which could be helpful in unusual situations.

Links with outside

MicroPen is one of a family of packages from Intelligence (Ireland); the closest in family resemblance is the word processor MicroScript (see Benchtest elsewhere in this issue), which can create the input the report format files needed by MicroPen. As MicroScript has no facilities exactly parallel to MicroPen's ability to merge structured information with running text, you would need to combine the two to get the full

features of word processing, mail-merge and simple information retrieval. At present there are no facilities to import data files into MicroPen, though a utility to do this is, I understand, in the pipeline. It shouldn't prove difficult, as MicroPen stores information in plain text, and though the format is rather unusual, it is completely predictable. I didn't have any trouble in writing a very short Basic program to convert my Bench-

mark data file, and I don't think it would have been any harder to write a similar program to convert MicroPen data to a more traditional format.

Software user image

By and large I found MicroPen very easy to use. Its basic approach is to use simple menus which appear at the top of the

```
XXXXXX
3=Delete
Wait...
Enter name of database:
or press <Return> to leave system.
----- Update prohibited, database in use elsewhere. -----
] Database:
, per record
, records in the database.
0=Exit, 1=Enter, 2=Recall, 3=Recall & print, 4=Index, 5=Re-organise.
Enter name for spool-file or <Return> for hard-copy print:
Press <Escape> when data entry completed for record:
Press ~ to clear field
0=Exit, 1=Continue edit, 2=Update database,
Enter name of output format or <Return>
] Recall by: 0=Exit, 1=Record number, 2=Search, 3=List all on file.
Lengthy procedure! Press '!' to confirm or any other key to abandon :-
Enter record number (1 =
Press <Escape> when search profile complete. To set search mode: ~U=Clear
~K=Contains, ~O=Not contains, ~P=Equals, ~N=Not equals, ~L=Greater, ~J=Less
Enter record number to begin recall:
] After recall: 0=Exit, 1=Pause, 2=Continue.

Press <Space-bar> to continue, <Return> to exit & update, <Escape> to exit.
Licensed user :-
Wait while database is read/updated.
This record is deleted! Press '!' to un-delete or any other key to continue.
Now printing report...
Now leaving MicroPen ....
PAGE SIZE
START LINE
END LINE
MARGIN
PAGE WIDTH
ACROSS
Enter INDEX to search for or <Return> only to exit.
Enter reference number or <Return>
for more or '0' to exit :-
to exit, all entries now listed:-
Press <Return> to continue or <Escape> to abort in print
Total entries found for:
#.CJWTR
27-29
32
32
0
-
-
27-71
27-75
80
9,5,8,19,13,28,27,127,20
11,15,16,17,12,10
91-93
27-31
1
20
10
0
space
100
7
```

MicroPen (c) P.Oshorn

Fig 6 Example command file

```
[ ] Database: 'B:PCWBTPEN', per record 152, records in the database, 1003
0=Exit, 1=Enter, 2=Recall, 3=Recall & print, 4=Index, 5=Re-organise.
```

'Menu' after Data File Specified

```
[ ] Recall by: 0=Exit, 1=Record number, 2=Search, 3=List all on file.
```

'Menu' after 'Recall' Specified

Fig 7 Two MicroPen 'menus'

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screen, so you always know what choices are currently open to you. Figure 7 shows two typical 'menu lines'.

As is common with menu-driven systems, on finishing a task you often have to go through several 'layers' to get back to the level at which you want to begin the next task. For instance, in the 'repair' function (which is a separate program from the main part of Pen), once you have finished unlocking a data file you then have to go through three levels of exit to get back to CP/M. Since you are most unlikely to want to carry out more than one repair function at a time, it would have been better to give the user another option after task completion, that of exiting to CP/M.

In MicroPen itself, sometimes the same problem arises and sometimes the reverse. An example of the latter occurs in the 'recall and print' option. This option involves the user giving the name of a record format file to use when printing, indicating whether a spooled print file or hard copy should be used, and selecting the method of recall. If the method chosen is recall by record number, you then specify the record number. But once that record has been processed, you are then back at the level you started from, and have to specify 'recall and print' and then all the details — such as the name of the print format file — all over again.

It would be much better to ask the user for another record number, with the option to return to the higher level if no more records are to be processed — especially as you can't specify a range of record numbers, just one at a time. Presumably the authors thought that most retrieval would be by selection on particular criteria rather than by record number, but it would be nice to have the option.

The other quarrel I have with the user image is over errors. There is a remarkable lack of error messages. I've mentioned the problem of trying to add too many records; another irritation was that often when I put in an invalid response I didn't get an error message, just a repeat of the prompt. For instance, when specifying the name of the data file you want to access, if you type the name of a file which doesn't exist the name is 'wiped' and the cursor repositioned at the start of the 'name' field. The mistake I'd made was obvious to me, but I'm not sure it would have been to a novice. This particular error is made harder to spot by the fact that although the data files available on the current disk are displayed, the only way to make the B drive the 'current disk' is to put the Pen command file (not the program) on every data disk, and to make the B logged drive before invoking MicroPen.

Documentation, training and support

The MicroPen manual is quite straightforward to read through, although I'd have liked more complete examples. However, the package comes with two complete sets of input format, data file and output

formats, so that wouldn't be too much of a problem. As is all too common, the manual has no index. Training for MicroPen is to be provided by Intelligence, for a fee, at locations in England as well as in Dublin. Support, which includes a 'hot-line' telephone support service, a newsletter and updates to the software, is available for an annual fee — see the next section.

Costs

The package itself costs £140, with an annual 'maintenance contract' for support and updates costing £60. The package runs on any standard CP/M system with floppy or hard disk. In addition to MicroPen itself, you would need a word processor or text editor to set up input forms. You could do this with the CP/M editor if you were familiar with it, or with your usual word processor if you have one — most people using CP/M are likely to fall into one of those groups, but it's a point to note. The package ran quite fast on those parts of the Benchmark which it could implement — the timings are given in Figure 8.

MicroPen is supplied by Intelligence (Ireland) Ltd, telephone Dublin (0001) 988555, who supplied my review copy; I'd like to thank the staff there for their help, especially the lady who answered most of my telephone queries.

Conclusions

MicroPen is basically a simple system for a simple price. If you already have word processing software, or can use the CP/M or similar editor, then the cost is £140. For that you get an easily-used package which

provides information storage, retrieval by key or by selection on the basis of one criterion per field, and flexible report printing. You also get a package which has the same approach and methods of use as its sister package, MicroScript.

There seems to be a general tendency towards 'families' of packages, each with similar user images. This has the great advantage that much of the learning from one package can be capitalised upon when learning another. A beginning has been made already by packages which use existing conventions — most notably the 'Wordstar' key conventions, used by packages such as dBaseII and Cardbox — or which allow easy transfer from one package to another to provide related facilities. The MicroPen/MicroScript set takes this approach a stage further; already available in the US (and coming over here) are packages like 1-2-3 which go further still.

To see if MicroPen is the package for you, I'd suggest taking this 'family' approach into account; if you haven't got a good word processor already, then have a look at MicroScript at the same time. However, the most important consideration will always be the features of the package itself, and here it would be worth comparing MicroPen with other packages which cost under £200, such as Pearl, Cardbox and the cheapest versions of DataPrism and Condor. (If you have a Sirius and your need is for a mailing-list/diary system, you should look at BusiPost too.) If you are looking for a simple, easy-to-use package with basic information storage and retrieval features, then MicroPen could be what you need.

END

BM1	Time to add 1 new field to each of 1000 records	na
BM2	Time to add 50 records interactively without index	scrolling time
	Time to add 50 records interactively with index	scrolling time
		+6 secs/record
BM3	Time to add 50 records 'in a batch'	na
BM4	Time to access 50 records from 1000 sequentially on 25-character field	4 mins 40 secs
BM5	Time to access 50 records from 1000 by index on 25-character field	2 secs/record
BM6	Time to index 1000 records on 25-character field	1 hr 20 mins
BM7	Time to sort 1000 records on 5-character field	na
BM8	Time to calculate on 1 field per record and store result in na record	
BM9	Time to total 3 fields over 1000 records	na
BM10	Time to import a file of 1000 records	as BM6*

Notes: na=Not available

*=plus time to write and run Basic program to pre-format unindexed file.

Fig 8 Benchmark times

Summary

System Type	CP/M-80 now, CP/M-86 and MS-DOS soon.
Package Type	Information management: single file, fixed length, fixed format records.
Facilities	Data entry, amendment, screen editing of data, selective recall, flexible reporting. No sorting or calculation.
Ease of Use	Simple, menu-driven, screen prompts.
Error Messages	Few, but mistakes usually fairly obvious.
Documentation	Clear manual, no index, sample files.
Costs	£140. Needs word processor editor to create input and output format files.
Supplier	Intelligence (Ireland); Dublin (0001) 988555.



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A WRITER'S PARADISE

Jon Vogler on the quest for a letter quality word processor at under £2000

For a writer the editing process used to be a tedium of red biro and frustration. The word processor, a computer with which one can edit text on a video screen until it is perfect, then print a flawless copy, is therefore the answer to a writer's prayer. Manufacturers advertise how famous thriller writers save hours producing each page. The snag, for this particular self-employed writer, was that my books sell three thousand copies, not three million, and dedicated word processors cost £5000 upwards.

Until two months ago I had never used a computer in my life. However a broken engagement recently left me time to kill, in a London office that produces educational computer cassettes. A suave, bearded individual (whose BMW outside hinted how high is the crest of the educational computing wave), remarked that one could put together a word processor for a fraction of the daunting sum mentioned above. He produced a copy of *PCW*, a magazine that I never previously knew existed, and we totalled prices to around £1500.

For three months, I followed up many adverts in the magazine but always with the same result: suppliers were full of blue sky promises but could not provide the tangible proof I wanted before blowing two months' earnings on expensive electronics. Books and articles about word processors were little help: none contained that essential element: a shopping list of specific boxes from specific suppliers, with the assurance that, when coupled together, the assembly would reproduce my flowing literary style.

It seemed that, by shopping around for best value in each individual component, I would lose the legal grip that would enable me to say to a supplier: 'You sold me this; now make it work or give me my money back'.

Two items exemplified this dilemma. A prosperous central London firm, whose staff and deep-carpeted offices seemed to double in size every time I contacted them, advertised a twenty-character-per-second, daisy-wheel printer at under £500 plus VAT. These TEC Starwriters had apparently been purchased by mighty Philips for their dedicated word processor but rejected as being too slow. It seemed fast enough for me with my small time anxiety to avoid waiting around while the machine printed a ten-page document. More important, the daisy wheel would make the print look like a typewriter, essential for editors (or friends!) who loathe the idea of corresponding with an automaton — cheaper dot matrix

printers, although faster, give the game away.

One problem: would this printer, only available with serial interface, hook up to the BBC Micro on which I had set my heart?

Disk drives caused a similar problem. The BBC's disk drives seemed either too small to store enough pages of text or too expensive at around £800 (and it seemed not actually available at the present time). However an American company, which has been in the disk business for years, was advertising drives at far more competitive prices: under £500 for 1 megabyte capacity.

At this stage, wanting to take the plunge but worried that the risks were still unacceptable high, two things happened. First I was offered a Globe Computer for under £2,000. It had a word-processing facility, a screen and two disk drives all built in. Like the BBC it would do other things than word-processing, such as keeping my small business accounts. The only extra I would need to buy was the printer. So, for an extra thousand pounds, most of the uncertainties would be removed.

At the same time however I met Dr. Colin Wormald of Eltec Computers in Bradford. Colin is a forty year old control systems engineer from Batley. He certainly did not match my stereotype of the trendy microcomputer salesman, luring rich businessmen with the hope that their children can miraculously learn the secrets of the electronic world. A year ago this scholarly, slow spoken Yorkshireman spotted that the BBC computers-in-education programme would offer rapid growth but required a more caring approach from dealers than the whizz-kids might offer. He took an agency for Acorn, which manufactures the BBC's micro, and was rewarded with the BBC agency in due course.

What attracted me about Colin was that, over the telephone, he took the trouble to explain what he thought I needed yet did not try to sell me anything. Indeed, he was actually rather difficult, explained that there was a limited number of BBC micros available with the vital 'disk interface' and he was not willing to sell me one unless I bought a disk drive from him. I explained that the BBC disk drive looked poor value and why I wanted one from the American firm. Colin rang up the firm's London agents, and then remarked doily: 'I wouldn't buy equipment from them.' It had been admitted that, although it was true that

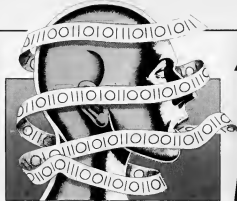
the American drives would operate with a BBC computer and that they had the advertised storage capacity, a substantial chunk of that storage would be used up in running them and would not be available for recording my masterpieces. Instead Colin offered me a Cuman disk drive at slightly higher price and with it the loan (but not sale due to the rules of his BBC agency) of the vital 'utilities disk' with which all disk operations have to begin.

It was his care over these enquiries which persuaded me to forget the easy option offered by the Globe and give Colin a cheque for £1,200. Inside the computer he fitted the microchip, which I had specified from Computer Concepts Ltd and which contained the essential word processing magic. Although the BBC has advertised its own package called View (and, scandalously, illustrated it on their television programme: 'Making the Most of the Micro'), I could not actually buy one yet. Not to worry; Wordwise is an excellent alternative, at the modest price of under £50.

I collected these on Christmas Eve for the most frustrating Christmas of my life! Although I managed to mend an old cassette recorder and operate with magnetic tape, I could not get the disk drive to run. Every time I telephoned Colin, he patiently told me what to do but it did not work. My wife, who works in Bradford, took the whole lot back. Colin tested it, said 'it's working fine' and returned it; still I could not make it work. When in the end I took it along myself the problem was solved in seconds: I had not been properly shutting the door on the disk drive. After that, learning to use the word processor was rapid: I was writing within ten minutes and, after two weeks and three or four articles of three thousand words, have mastered it.

Eileen, my part-time secretary, was another matter! Having spent a lifetime becoming an extremely efficient typist she was apprehensive of the unfamiliar electronic jumble and aggrieved to unlearn practices at which she had become so proficient. My preliminary reverses and frustrations with the disk drive did nothing to allay fears. However, since the system has demonstrated its sparkling results, so her enthusiasm has increased and her willingness to learn with it. She wanted to go on a proper word processor operator's course but this would be on a different make of machine.

I had planned to save the cost of a monitor by using an old black-and-white televi-



AN INTRODUCTION TO LISP

J P Bennett presents a powerful language in a readily digestible format.

In the first of two articles on Lisp I shall explain the structure and use of one of the oldest high-level programming languages. In the second article David Johnson-Davies will present and explain a large Lisp program, Eliza, which will run on most micro implementations of Lisp, mimicking the questions asked by a psychiatrist during a consultation.

Lisp is a very old language. The ideas behind the languages were first put forward by John McCarthy and his associates at Massachusetts Institute of Technology (MIT) in the late 1950's, around the time Cobol was invented, two years before Algol was thought of, eight years before the Fortran standard was published and a decade before Basic became popular. Remarkably, Lisp is now used more than ever before and has provided the basis for the new fifth generation languages, such as Logo and Prolog.

The uses of Lisp have been widespread. The best known are in artificial intelligence, of which the Eliza program to be described in the next article is an example. However the language's underlying strength in symbol handling and the ease with which Lisp programs are modified and extended, have led to its use in high precision arithmetic and algebraic manipulation, and recently to Atari's use of Lisp machines for high speed testing of new game ideas.

Lisp stands for LISt Processing language. A program consists merely of a list of functions to be evaluated. Exactly what is meant by a list will be explained later. More important first is the use of functions throughout Lisp.

We are used to functions in Basic, such as:

```
SIN (3.14159)
LOG (2.71828)
CHRS (30)
```

We are also used to expressions such as:

```
3+2
4*3
6+5*7
```

Such expressions could however be written as functions

```
PLUS (3,2)
TIMES (4,3)
PLUS (6,TIMES(5,7))
```

This is how such expressions have to be written in Lisp. They may seem verbose, but they do have advantages. Bracketing of expression is no longer necessary. If we want the last expression above to be evaluated as:

```
(6+5)*7
```

Then we write:
TIMES (PLUS (6,5),7)

and the meaning is clear from the order of the functions.

Lisp uses a slightly different notation known as S-notation. Instead of:

```
PLUS (3,2)
```

we write:

```
(PLUS 3 2)
```

Spaces rather than commas separate items, and the first item is a function to apply to the rest of the items. Brackets go round the outside to indicate that this is a single unit; capable of evaluation on its own to yield the value 5. This strange bracketing eventually becomes familiar, but is a common source of programming errors with beginners.

The previous expressions are then written:

```
(TIMES 4 3)
```

and

```
(PLUS 6 (TIMES 5 7))
```

All the features of normal programming languages can be used as functions. For instance the Basic statement:

```
LET A = 3 (or just A = 3)
```

becomes:

```
(SETQ A 3)
```

and similarly

```
IF A < 0 THEN PRINT "NEGATIVE"
```

```
ELSE PRINT "POSITIVE"
```

becomes:

```
(COND
```

```
((LESSP A 0) (PRINT 'NEGATIVE))
```

```
(T (PRINT 'POSITIVE)))
```

The COND function is in fact slightly different, and rather more general than the Basic IF statement; it has the general form:

```
(COND
```

```
(condition1 expression1)
```

```
(condition2 expression2)
```

```
(condition expression ))
```

Each condition is evaluated in turn until one is true, and then the expression following is evaluated and returned as the result of the COND function. If no condition is true then the special value NIL, (of which more later) is returned. The conditions used above were:

```
(LESSP A 0)
```

The function LESSP returns true if its first argument is less than its second.

and

T

an item, not a function whose value is always true.

and the expressions used were

```
(PRINT 'NEGATIVE)
```

and

```
(PRINT 'POSITIVE) Which do the obvious
```

New functions are defined by using the built in function DEFUN (in some versions of Lisp called DE instead). Thus we could define the factorial function as:

```
(DEFUN FACT (N)
```

```
(COND
```

```
((EQ N 1) 1)
```

```
(T (TIMES N (FACT
```

```
(DIFFERENCE N 1))))))
```

Note the use of indentation to make the meaning clear. The function DEFUN takes any number of arguments. The first is the name of the function being defined, the second is a list of arguments (in brackets), and the rest are functions to be evaluated when the function is used. The result returned when the function is called is the value of the last expression evaluated.

This definition of FACT is recursive—it calls itself. Thus factorial 3 would be:

```
(FACT 3)
```

which is evaluated as:

```
(TIMES 3 (FACT 2))
```

which is:

```
(TIMES 3 (TIMES 2 (FACT 1)))
```

now (FACT 1) is 1 (N being now EQ to 1), and so this becomes:

```
(TIMES 3 (TIMES 2 1))
```

ie, 6

Lisp relies heavily on recursion, since it has no looping structures, such as the FOR-NEXT or REPEAT-UNTIL of Basic, nor does it have GOTO statements, at least not in pure Lisp. If you want to do something more than once you have to do it recursively. For instance the Basic program:

```
SUM = 0
```

```
FOR I = 1 TO 10
```

```
SUM = SUM + I
```

```
NEXT
```

could be evaluated by a recursive function such as:

```
(DEFUN LOOPSUM (I)
```

```
(COND
```

```
((EQ I 10) 1)
```

```
(T (PLUS I (LOOPSUM (PLUS
```

```
I 1))))))
```

and the result could be put in SUM by:

```
(SETQ SUM (LOOPSUM 1))
```

This is the second problem for beginners. Recursion is a concept that does not come easily, particularly if you are used to Basic. In practice it takes some time for novice programmers to start to appreciate its use, and then to realise that it is the most power-

ful programming tool available. Once you do get used to it you will wonder how you managed without it.

Now to return to the lists mentioned earlier. We have already seen several lists:

(PLUS 3 2)

(TIMES 4 5)

and so on. Any series of items inside brackets is a list. Thus

(A B C D)

is a list, and

((A B) (C D))

is a list of lists.

In Lisp anything that is not a list is called an atom, since unlike lists, atoms are indivisible. Let us look more closely at a simple list:

(A B C)
How is this represented in the computer? Lisp handles everything as pairs of locations in the computer's memory. Thus the list (A B C) is represented as three pairs of locations:



The arrows are pointers in the computer's memory. A pointer is merely the address of the location in the computer's memory being pointed to. If we draw some hypothetical computer locations we can see how the above list might be represented:

12	A	13	18
14	C	15	-1
16		17	
18	B	19	14
20		21	

Pairs of locations from 12 to 21 in the computer's memory are shown. Notice how the second field of the A pair holds the address of the B pair, and how the second field of the B pair holds the address of the C pair. The second field of the C pair is -1 to show that this is the end of the list and doesn't point anywhere. Notice how the order of A B and C in memory is unimportant, since the order in the list is all handled by pointers.

(PLUS 3 2)

is also a list and is represented as:



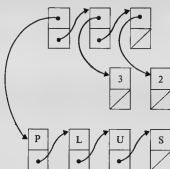
The symbol:



is used to mean 'end of list', and is the special atom NIL referred to earlier, ie, the address of -1 used in the previous illustration.

Practical programmers will realise that while you can fit the character A in one location, you cannot fit the characters PLUS in one location. This is indeed the case and in each of the first fields of the pairs of locations there are pointers, which point to the print names, or values, thus the

previous list is better shown as:



In fact Lisp needs to know whether it has a character, or a number, or a pointer in a location, and so usually a few bits are reserved in each location to show what sort of item is there. You should not make the mistake of assuming that locations in the computer's memory are equivalent to bytes. 8 bits are not enough for holding addresses, and flags etc., and so commonly LISP breaks memory up into 16 or 24 bit locations, for use. This is a mere technicality and should not worry the Lisp programmer, since such things are hidden from him.

By now the underlying uniformity of Lisp should be much more apparent. Both expressions, such as:

(PLUS 1 2)

and data, such as:

'POSITIVE

are represented as lists.

How do you go about "executing" a Lisp program? Most micro-implementations of Lisp operate in 'evaluate' mode. They usually give you a prompt, such as:

'Evaluate:'

You then type in a function to evaluate, such as:

(PLUS 3 2)

and the Lisp system will evaluate it. Evaluation consists of walking over the list representing the function and performing the functions represented. For instance here:



The evaluator encounters the first item PLUS and realises it requires two arguments. It gets these two arguments by following down the pointers to find 2 and 3, adds them and returns the value, typically by a reply such as:

Value is: 5

You will find lists for evaluation such as these referred to in the literature as S-expressions.

Since both programs and data have the same form, programs may be written to modify programs. Lisp provides some rather strangely named functions to manipulate lists. Consider a list FRED (SETQ FRED '(A B C D)) (Note that the ' merely means don't evaluate this list as though it were an S-expression, but set FRED up to point to it). The function CAR is used to obtain the first item in the list viz.

(CAR FRED)

will give A.

The opposite function is CDR, to give the rest of the list.

(CDR FRED)

will give (B C D).

The obscure names for these functions stand for Contents of Address Register and Contents of Data Register, and refer to the IBM 709 on which Lisp was first implemented.

Looking at our box picture:



CAR gives the first location of the object referred to by FRED ie,



and CDR gives the second viz.



Assorted other functions exist to modify lists in other useful ways.

The power of Lisp comes from the way it is built up from a set of standard functions. These functions are held on a list maintained by the Lisp system, the object list or OBLIST. This initially has useful functions, such as PLUS, TIMES, CAR, CDR and so on. Every time you define a function using DEFUN it is added to this list. Running a program consists of evaluating a function you have defined, which in turn evaluates other functions you have defined on the OBLIST and so on. Thus to extend a program you just add a few functions to the OBLIST you already have and modify existing functions to evaluate them. Program development is fast, because you can test each function on the OBLIST individually before building them into the main body of routines, and also because this type of system encourages a tree-structured program, consisting of important functions evaluated as part of the main function and less important functions evaluated by the important functions and so on down to the very small functions at the bottom of the tree.

This idea of using your Lisp system, surrounded by all the functions you need, is why programmers talk of a Lisp environment and Lisp machines, rather than Lisp program. There is no one entity clearly definable as the program, merely a pool of functions on the OBLIST, all calling each other, in a way that is powerful and flexible. As you work with Lisp you too will discover the addiction for this language, common among all its users.

FURTHER READING

I would not recommend the original report by McCarthy as a good introduction to the language. The best introduction is probably *A Programmer's Introduction to Lisp* by W.D. Maurer, published by MacDonald/American Elsevier Computer Monographs, 1972.

For users with BBC micros a better book is *Lisp on the BBC Microcomputer* by Gillian Cattell and Arthur Norman, published by Acornsoft.



IN STORE

Our bi-monthly guide to microcomputing systems. Updates should be sent to:
Dick Olney, PCW, 62 Oxford Street, London W1A 2HG.

Machine (Price from)	Main Distributor/s (No. of Dealers)	Hardware	Software	Miscellaneous (Documentation)
ABC 26 (£4500)	AI 09237-70578(19)	64k RAM: Z80A; dual 8" F/D (2.3Mb); 12", 24 x 80 VDU: 2 x RS232 ports: 3 x P/P	CP/M: MP/M Basic; Cobol: Fortran; Pascal.	Options: 10Mb H/D £4000. BT 4/81 (S).
ABC 80 (£738)	Datamark Ltd: 97 44896	16-40k RAM: Z80A; C: 12"; 16 x 40 b/w VDU; 4680 bus; IEE 488; RS232 port.	DOS Basic (16k ROM); Fortran; Pascal; A; Multi user Basic.	Colour video graphics with UHF output. Viewdata compatible. Loudspeaker. Numeric keypad. Options: dual 5 1/4" F/D (320k) £895; dual 8" F/D (2 Mb). BT 1/80. (1)
Acclaim (£3650)	Country Computers 0527 29826	64k RAM: Z80; 24x80 VDU; single 5 1/4" F/D (140k); 5 MB H/D; RS232 port. Option: P/P	CP/M; Basic; Cobol; Fortran; Pascal	Various integral H/D options up to 21MB (£4450)
ACT Sirius 1 (£2395)	ACT 021 501 2284 (50)	128-512k RAM; 8088; dual 5 1/4" F/D (1.2Mb); 12", 25 x 80 VDU; 2 x RS232 ports: 2 x P/P	CP/M 86; U; Basic 86 Cobol; Fortran; Pascal	High res graphics. Options: 10 Mb H/D; dual 5 1/4" F/D (2.4 Mb) BT 2/82 (S)
Adler Alphatronic (£1895)	Adler 01-250 1717	48-64k RAM; 8085A; dual 5 1/4" F/D (1Mb); 12", 24 x 80 VDU; S/P; P/P	CP/M; Basic; CBasic; Fortran; Cobol	With 80 cps printer and dual F/D £2345 (inc CP/M). (S)
Altos ACS 800-2 (£33)	Logitek: 0257 426644 (33)	64k RAM; Z80A; dual 8" F/D (1 Mb); 2 x RS232 ports: 2 P/P.	CP/M; Basic; CBasic; Cobol.	Single user. Options: DMA. Floating point processor. Phototyping board.
Altos ACS 8000- 10 (£6675)	As above.	280k RAM: Z80A; single 8" F/D (500k); 10 Mb H/D; 6 x RS232 ports: P/P; network RS422 port; DMA	CP/M; MP/M; Basic; Cobol; Fortran; APL; Pascal.	Multi-user/multi tasking. Up to 4 users. Options: 10 Mb; mag tape backup (S + H).
APL Signet (£1750 or £130pm)	Micro APL: 01-834 2687	64k RAM; Z80A; dual 5 1/4" F/D (380k); 2 x RS232 ports.	CP/M; APL; Basic; U; Fortran; Cobol; Algol; Forth	Desktop APL computer with self teaching course. (S)
Apple II (£695)	Apple (UK) 0442 60244 (200 +)	16-48k, RAM: 6502; 8 I/O slots.	OS: Basic; Pascal; Fortran; Cobol; Pilot	280 x 192 high resolution graphics; Option: single 5 1/4" F/D (116k) £349.
Apple III (£2496)	As above	128-256k RAM: 6502B; dual 5 1/4" F/D (286k); 12", 24x80 VDU; RS232 port; P/P.	SOS; Basic; Pascal;	Options: single 5 1/4" F/D (143k) £384; 5Mb H/D £2256. (E) BT 5/82
Atari 400 (£200 inc VAT)	Atari UK: Slough 33344	16k RAM: 6502; C int; cartridge slot; 24 x 40 TV int; touchpad k/b; Opt: C £50	OS (10k ROM); Basic (8k ROM); Pilot: A;	High resolution colour graphics. 4-channel sound. Four games controller/light pen sockets. BT 10/80. (1/P)
Atari 800 (£500 inc VAT)	As above.	16-48k RAM: 6502; C int; 2 x cartridge slots; 24 x 40 TV int; Opt: single 5 1/4" F/D (90k) £500; 16k RAM £65.	OS (10k ROM) Basic (8k ROM); Pilot A; Forth; MBasic (1/B).	As above. Software & RAM on cartridge modules. Up to 8 drives RS232C int £135. BT 10/80.
Atom (£120)	Acorn: 0223 245200 (160)	2-12k RAM; 8-16k ROM 6502; Full K/B; C int; TV int; 20 I/O lines; 1 P/P. Options: 80 col printer £199, Prestel adaptor £120.	Basic in 8k ROM; A Cass O/S; Lisp; Forth	High resolution graphics on bigger model: Single 5 1/4" F/D £297 B/ 7/80 (B)
BASF 7120 (£4400)	BASF: 01-388 4200 (12)	88k RAM: 2xZ80A; 3 x 5 1/4" F/D (480k); 12", 24 x 80 VDU; RS232 port; P/P	DOS; (OASIS) Ex Basic; Cobol U. A; CP/M	H/D available. Also 7125 with 960k F/D £4900 and 7130 with single F/D (430k) & 5Mb H/D £6300. Disk controller has own Z80A. BT 9/80
BBC Micro (£299 inc VAT)	BBC Micro Systems 0933 79300	16-32k RAM; 32k ROM 6502; C int; TV int; RS422 port; P/P; Option: single 5 1/4" F/D (100k) £230	MOS; Basic A; Pascal Logo; Forth; Lisp	Video text & second processor int. 32k model with Econet and disk interface £399. BT 1/82 (1)
Bonsai SM3000 (£1995)	Bonsai 01-580 0902	64k RAM; Z80; dual 5 1/4" F/D (700k); 12", 24x80 VDU; RS232 port; P/P	CP/M; Basic; Cobol; Pascal; Fortran	Many floppy and hard disk options. Applications software avail. from Bonsai.
Computers Lynx (£225 inc VAT)	Computers Ltd 0223 315063 (TBA)	48-192k RAM: Z80A; 24x40 TV int; C int; RS232 port	Basic	248 x 256 colour graphics (8 colour). CP/M compatible 5 1/4" F/D & printer avail soon. (B)
Canon BX-3 (£3000)	Canon 01-680-7700.	32k RAM; 6809; dual 5 1/4" F/D (640k); 28 char display; 80 cps printer; 3 x RS232 port; P/P.	OS: Basic; A; Cobol; Pascal	Fully integral unit. Extensive applications support offered on all Cannon Machines. Options: dual dual 5 1/4" F/D (640k) £1500.
Canon CX-1 (£2500)	As above.	32k RAM; 6809; dual 5 1/4" F/D (640k); 12", 24 x 80 VDU; 3 x V24 ports: P/P; light pen.	OS: Basic; A; Cobol; Pascal	Price includes installation & training. Extensive application support offered. Options: dual 8" F/D (1Mb) £3300.(S)
Canon TX-25 (£1450)	As above.	16-32k RAM; 6809; C; 20 char display; 26 col, 2.4 lps printer. Option: 2 x RS232 port.	Basic; A	Fully integral unit. Cassette is Cannon's own design (8k). Can be used with communications. (S).
Cleno Pronto (£8225)	Cleno Computing Systems Ltd; 01-670 4202 (TBA)	64k RAM; Z80; dual 8" F/D (1 Mb); 3 S/P; 2 P/P.	CP/M; CBasic-2; Pearl I; U Fortran; Cobol; Pascal	With 2.4Mb F/D £3105. Also H/D systems with 5-20 Mb H/D & tape drive £5430.

List of Abbreviations

A Assembler	G/C Graphics card	M/A Macro assembler	S Software
BT Bench Tested	H Hardware	N/A Not available	S/P Serial port
C Cassette	H/D Hard disk	N/E Numeric pad	T/E Text editor
E Extensive	I Introductory	O/S Operating system	TBA To be announced
F/D Floppy disk	I Int Interface	P/P Parallel port	U Utility

Please note: Software items listed in *italics* are not included in the basic price of the equipment. All prices are exclusive of VAT.

IN STORE

Machine (Price from)	Main Distributor's (No. of Dealers)	Hardware	Software	Miscellaneous (Documentation)
Cleno Table Top 525 (£1750)	As above	64k RAM: Z80 dual 5¼" F/D; 2xS/P	CP/M; MBasic; W/P	Wordstar & Logiscale included in price. Many options
Colour Genie (£200 inc VAT)	Low Electronics 0629 2403 (100+)	16-32k RAM: Z80; 16k ROM: C int; 24x40 TV int; Audio port; RS232 port: P/P	ExBasic	160x96 colour graphics, 16k RAM £30. Many options inc joysticks and light pen. F/D avail soon. (B)
Columbia PC (£2800)	Icarus 01 485 5574 (50)	128k RAM: M8088; dual 5¼" F/D (640k); 24x80 VDU: 2xRS232 ports: P/P; 8 expansion slots	MS-DOS; CP/M 86; Basic; Cobol; Fortran; Pascal	IBM PC compatible. With Integral H/D (5 Mb) £4200 or (10 Mb) £4550 (S)
Comart Communicator (£1895)	Comart 0480 215005 (25)	64k RAM: Z80A; dual 5¼" F/D (780k); 2 S/P; P/P.	CP/M; MP/M Basic; Cobol; Fortran; Pascal	With 1.5 Mb F/D £2195. With 4.8 Mb H/D & 790k F/D £3995. Option: 18 Mb H/D. £3895 Also CP100 range with 8086 & 128k-1Mb RAM from £2295. Expandable to multiuser/multitasking. (S)
Commodore PET 16k, & 32k (£550, £695)	Commodore: 0753 79292 (150)	16-32k RAM: 6502; C: 12" 25x40 VDU: IEEE-488 port; Options: dual 5¼" F/D (343k) £695; same but (1018k) £895	O/S; Basic (in 8k ROM); Forth; Pilot; Pascal; Comal; Lisp; A	CBM 8032 with 80-col screen (32-96k) BT 12/80. £895 Field service avail. (1).
Commodore Vic 20 (£200 inc VAT)	Commodore: 0753 79292 (150)	5-32k RAM: 6502; C int; 22 x 23 TV int: S/P; P/P; Games int.	Basic	Graphics 3 tone sound generator. Will interface to PET. Option: single 5¼" F/D (170k). BT 9/81(S).
Commodore 500 Series (From £659)	As above	128-896k RAM: 6509; 25x40 TV int: P/P	O/S; Basic; CP/M; Pascal; Forth; Cobol; Fortran	High res. 16-colour graphics. Second processor option: Prestel facility avail.
Commodore 700 Series (From £995)	As above	128-896k RAM: 6509; 24x80 VDU: Option: dual 5¼" F/D (1Mb); IEEE-488 port: RS232C port.	As above	8088 or 280 second processor option Tilt and swivel screen.
Commodore 64 (£299)	As above	64k RAM: 6509; 25x40 TV int: C int: RS232 port: P/P	Basic	Second processor option. 320x200 colour graphics. Option: Joystick: Light pen
Compucorp 625 (£6000)	Compucorp: 01-907 0198 (17)	48-60k RAM: Z80; dual 5¼" F/D (630k); 9". 16x80 VDU: 40 col printer: RS232 port, P/P.	Basic; A; Fortran; Pascal; U	IEEE-488 Controller and S100 interface. Many applications packages avail. (E).
Compucorp 655/665/675/685 (From £5030)	As above	60k RAM: Z80; Up to 4x5¼" F/D (160k-2.4 Mb); 9", 20x80 or 12" 20x80 or 20" 60x80 VDU: 40-col printer: RS232 port.	As above	Prices incl installation and training. Opt: 10-20 Mb H/D
Cromemco System Zero/DDP, System 2, System 3, System Z2H. (£1975/£3095/£4495/£6585).	Datron: 0742 585490; Comart: 0480 215005 (25) MicroCentre: 031-356 7354 (18)	64k RAM: Z80; dual 5¼" F/D (890k) on System Zero, System 2 & Z2H; dual 8" F/D (1.2 Mb) on Sys 3; 10 Mb H/D on Z2H; S/P; P/P.	CDOS; Basic; Cobol; Fortran; RPG II; Lisp; A; W/P; Multi-user Basic, Cromix, CP/M	System 2 & 3 expandable to Multi-user (max 7) Also 'D' series with 6800/280A dual processor from £3620. Options: dual 8" F/D (996k); 11.2Mb H/D. BT 10/79 (E).
DAI (£595)	Data Applications (UK): 0285 2588 (7)	48k RAM: 8080; C int: 24x60 VDU int: RS232 port: over 20 industrial ints. option: dual 5¼" F/D £595	Basic (ROM); U	Colour graphics up to 255 x 335: 3 notes & noise generator; PAL. O/P to TV; Paddle int: H maths option. (1). BT 10/80.
Diablo 3000 (£6250)	Business Computers Ltd: 01-207 3344	32k RAM: 8085; dual 8" F/D (1.3 Mb); 12", 24x80 b&w VDU: 45 cps printer.	DOS; Basic; DACL; A; U.	Selection of business packages included (S).
Digital Microsystems DMS-3 (£3530)	Digital Microsystems 0734 343885 (14)	64k RAM: Z80A; dual 8" F/D (1.14Mb); 3xRS232 ports: 1xRS422 port: P/P.	CP/M; CBasic; Cobol; Fortran; Pascal; PL/I	Expandable to multi-user system with 10-28 Mb H/D. Extensive software avail. (S).
Digital Microsystems DMS-4 (£4395)	As above	128-512k RAM: Z80A; single 8" F/D (500k); 11 Mb H/D: 4x RS232 ports: P/P.	CP/M; Basic-E; CBasic; Cobol; Fortran; Pascal.	Port expander to enable up to 10 workstations under M/P/M. Options: 128k RAM £1295; up to 96Mb H/D. (H).
Dragon 32 (£200 inc VAT)	Dragon Data 0792 580651 (50 +)	32-64k RAM: 6809E; 16x32 TV int: C int: P/P	Basic	9 colour 256x192 high resolution graphics. Option: Joysticks BT 8/82
Durango F-85 (£4995)	Comp Ancillaries: 0784 36455 (12)	64k RAM: 8085; dual 5¼" F/D (1 Mb); 9", 16x64 green VDU: 132 col 165 cps printer: N/P.	O/S; D Basic; CP/M; CBasic; Micro Cobol.	Up to 3 work stations; fully integrated system. Options: additional dual 5¼" F/D (1 Mb); 12-24 Mb H/D (S).
Eagle II, III and IV (from £2350)	Mediatech Bus Syst 01 903 4372	64k RAM: Z80A; dual 5¼" F/D (768k and 1.5Mb) or single 5¼" F/D (784k); with 10Mb H/D: 2xRS232 ports: 2 x P/P	CP/M; CBasic; Cobol Pascal; Fortran	Many different configurations available. Full range of applications software
Epson HX20 (£402)	Epson	16-32k RAM; 32k ROM; Twin 6301 CPU; 20x4 LCD; RS232 port: Micro dot matrix printer	E Basic	Display gives 120 x 32 dot graphics. Options: TV int; micro-cassette drive; expansion module. BT 12/82
Equinox 200 (£7500)	Equinox: 01-739 2387 (N/A)	64-512k RAM: Z80; 10 Mb-1200 Mb H/D; 6xS/P; 1 P/P.	CP/M; CBasic; Cobol; Fortran.	Multi-user MVT/FAMOS available in place of CP/M. 16-bit version (Equinox 300) £10,000. (S&H).
Fortune 32:16 (£4375)	Fortune Systems 01 938 1721	256-512k RAM: MC 68000; dual 5¼" F/D (800k); 12", 25x80 VDU: S/P; P/P	FOS; CP/M; Basic; Pascal; Cobol; Fortran; C	Expandable to full multi-user system. High res colour graphics
Gecac 64/2 (£3305)	Gecac Micros 01 629 3758	64k RAM: Z80A; dual 8" F/D (2.4 Mb); S100 bus.	CP/M; Cobol; Basic Pascal Fortran	Up to 4.8 Mb F/D. Expandable to multi-user/multitasking system.

List of Abbreviations

A Assembler
BT Bench Tested
C Cassette
E Extensive
F/D Floppy disk

G/C Graphics card
H Hardware
H/D Hard disk
I Introductory
Int Interface

M/A Macro assembler
N/A Not available
N/P Numeric pad
O/S Operating system
P/P Parallel port

S Software
S/P Serial port
T/E Text editor
TBA To be announced
U Utility

Please note: Software items listed in *italics* are not included in the basic price of the equipment. All prices are *exclusive* of VAT.

Three out of every four computers going into schools are BBC Micros.

Is there a lesson to be learned by every user?

As part of the current government subsidised scheme aimed at introducing micros to schools, the Department of Industry undertook a survey of machines available and made recommendations to education authorities all over the country.

The BBC Micro met their priorities exactly: it is economical yet fast and powerful, and it can justify the investment involved, through its capability to grow with the needs of the user and with the rapid changes in technology.

Teachers and education authorities agreed, and today it represents over three-quarters of all micros being ordered for schools across the country under the DOI scheme.

The BBC's choice too.

In choosing a machine to put their name to for their massive Computer Literacy Project, the BBC had the same set of priorities as the DOI. The BBC Micro is now an integral part of that project, which includes books, software, courses and a number of major television series, one of which, "Making the Most of the Micro" is now being broadcast.

All this for only £399.

The BBC Micro is light and compact. It generates high resolution colour graphics, and is capable of synthesising music and speech using its own internal speaker. The keyboard uses a conventional layout and typewriter feel.

The most sophisticated version (called

Model B) is available for only £399. (There is also a basic model available, the Model A, at £299.)

Designed to grow.

Last year the magazine "Which Micro?" said that the most attractive and exciting feature of the BBC Microcomputer was its 'enormous potential for expansion'.

This is indeed one of the features that sets it aside from the competition.

For example, as well as interface sockets to allow you to connect to a cassette recorder, and to your own television, you can also use videomonitors, disc drives, printers (dot matrix and daisy wheel) and paddles for games or laboratory use.

You can also plug in ROM cartridges containing games with specialist application programs.

The Tube. A unique feature.

The Tube, which is unique to the BBC Micro, provides for the addition of a second processor via a high speed data channel. The possibilities are enormous. For example, the addition of a second



3MHz 6502 processor with 64K of RAM doubles processing speed. While a Z80 with 64K of RAM opens the door to a fully CP/M* compatible operating system, with all the benefits for business applications.

Linking up with other computers.

The BBC Micro also offers a facility of immense potential value to schools, colleges and businesses. It's called Econet®—a system which uses telephone cable to link with other BBC Micros. A number of machines can then share the use of expensive disc drive and printer facilities.

Make full use of Prestel & Teletext.

With special adaptors you will not only be able to turn your TV set into a Prestel terminal and Teletext receiver, but you can also take data and programs direct from these services. (The programs, which are known as telesoftware, are already being broadcast by BBC's Ceefax service.) This is another first for the BBC Micro.

BASIC plus.

A sophisticated version of BASIC has been chosen for the BBC Micro, which incorporates features normally found only in more advanced high level languages. However, there is also a facility allowing access through a simple command to another language—for example, PASCAL, FORTH and LISP.

*Trademark of Digital Research.



A full range of software.

Applications software for the BBC Micro already cover a very wide field. Packages covering games, education and business applications are available on cassette. All developed to the same high standards set by the hardware.

The best possible back-up.

Your BBC Micro comes with the backing of the BBC and an extensive dealer and service network.

Each approved dealer is able to offer advice and carry out expansion work and repairs.

BBC Microcomputer – Model A and Model B.
2MHz 6502A Processor.
32K ROM; 16K RAM Model A, 32K RAM Model B.
Full QWERTY keyboard with 10 user-definable function keys.
Mixed high resolution graphics and upper and lower case text.
300 baud and 1200 baud interface for standard cassette recorders.
Three-voice music synthesis with full envelope control feeding internal loudspeaker.
Interface sockets (Model B only) – RS423, for analog inputs centronics and user port.
6502, Z80, 16032 second processors.
Single and Dual Disc Drives with 100 and 800 K-bytes storage.
Teletext unit.
Speech synthesis.
Networking facility – via Acorn Econet®

How to buy your BBC Micro.

If you are a credit card holder and would like to buy a BBC Micro B, or if you would like the address of your nearest stockist, just phone 01-200 0200.

Alternatively, you can buy a Model B directly by sending off the order form below to: BBC Microcomputers, c/o Vector Marketing, Denington Estate, Wellingborough, Northants, NN8 2RL.

All orders are despatched by fully insured courier and come complete with easy to follow 500 page User Guide and Welcome cassette.



01-200 0200 credit card holders.

To BBC Microcomputers, c/o Vector Marketing, Denington Estate, Wellingborough, Northants NN8 2RL. Please send me _____ BBC Model B Microcomputers at £399 each, inc. VAT and delivery. I enclose PO/cheque payable to Acorn Computers Limited Readers A/C or charge my credit card.

Card Number _____
Amex/Diners/Visa/Access (Delete)

Name _____

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Postcode _____

Signature _____

PCW5
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The BBC Microcomputer System.

Designed, produced and distributed by Acorn Computers Limited.

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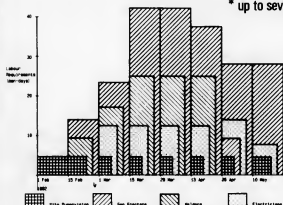
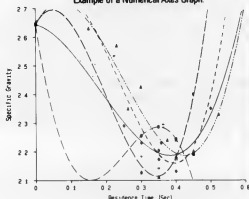
MICROPLOT is a CP/M Graph Drawing Package

interfacing with A4 size flat bed plotters
Ideal for business and engineering applications

A comprehensive GRAPH configuration

- * axes may be user defined or automatically fixed
- * data points may be defined or suppressed
- * straight joining lines or curves, the latter from complex calculations automatically executed
- * up to eight colours available
- * up to seven broken line patterns

Example of a Numerical Axes Graph



A correctly proportioned HISTOGRAM configuration

- * operates like GRAPH but structures in block format
- * various shading patterns available

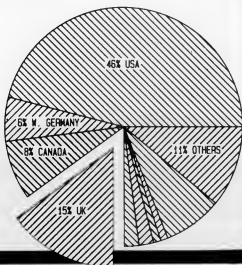
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- * segments can be shown withdrawn
- * various shading patterns offered
- * up to eight colours available

No screen necessary. MICROPLOT draws on paper for reports or on film for overhead projection. Will also interface with Supercalc and Micro Modeller. Single or multi coloured plotters supplied.

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* All three diagrams reproduced directly from Microplot.



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IN STORE

Machine (Price from)	Main Distributor/s (No. of Dealers)	Hardware	Software	Miscellaneous (Documentation)
Gemini Multiboard (£500)	Micro Value 02403 28321(7)	64k RAM: Z80; 25 x 80 VDU int (with Z80); Option: dual 5 1/4" F/D £690.	CP/M: Basic Cobol; Pascal Fortran AP/L	Modular system. Other options inc ROM board & EPROM programmer. BT 2/82 (H&S).
Gemini Galaxy 2 (£1495)	As above	64k RAM: Z80A; dual 5 1/4" F/D (800k); 12", 25x80 VDU: RS232 port: P/P; C int	CP/M: Basic; Cobol; Fortran; Pascal; AP/L; A	Options: dual 5 1/4" FD (800k); dual 8" F/D (2.4Mb)
Gimix System 68 (£2000)	SEED: 05433 78151; Windrush 0692 505189	16-64k RAM: 6800/6809; dual 5 1/4" F/D (500k); 2xRS232 ports.	OS-9; Flex Basic; Pascal; A: Dis A: T/E:U	With dual 8" F/D (2 Mb) £2900. Designed as development system for industrial control. (H).
Genie I (£2999)	Lowe Electronics: 0629 2430 (N/A)	16k RAM: Z80; 500bps C; 16 x 64 TV int; extra C int: 1 P/P	Basic (12k ROM); Pascal: A M/A: Fortran	Options: single 5 1/4" F/D (184k) £220; dual 5 1/4" F/D (368k) £375 (I) Also Genie II with numeric keypad and function keys but no cassette (same price as I).
Genie III (£1900)	As above (26)	64k RAM: Z80A; dual 5 1/4" F/D (1.25 Mb); 24x80 VDU: RS232 port: P/P	NewDOS 8.0; CP/MZ; Basic; Cobol; Fortran Pascal	System complete with business applications software, maintenance contract and choice of printer £3250 (S).
Grundy 8200 (£1850)	M-Tech Comp Serv. 0603 870620	64-256k RAM: Z80A; dual 8" F/D (2Mb); 24x80 VDU: RS232 port: P/P	CP/M; Basic; Cobol; Fortran; Pascal; Forth; PL/I; Ada	Various hard disk options up to 26Mb
Haywood 9000 Composite (£1795)	Haywood: 01- 428 0111. (TBA)	64-192k RAM: Z80A; dual 5 1/4" F/D (640k); RS232 port: P/P. 15" 28x80 VDU.	CP/M; Basic; Cobol; Fortran; Pascal; W/P.	Graphics avail. Expandable to 18 Mb H/D. Networking version planned (H&S)
Haywood Hinet (£7500)	As above	64k RAM: Z80A; dual 8" F/D (2Mb); 11Mb H/D; RS232 port: RS422 port: P/P. 24x80 VDU	CP/M: HiNet; Basic; Cobol; Fortran; Pascal	Local area network, up to 32 users. Range of H/D avail. Local disks & printers if required. Work station £2050 (H&S)
HP 75C (£728)	As above	16-24k RAM: 48k ROM; CPU: 32 char display; mag card reader	Basic	8k RAM £142. Video interface £221. Thermal printer £371. (E) BT 11/82
HP 85 (£2013)	Hewlett Packard Ltd: 0734 784774 (16)	16-32k RAM: C.P.U.: 5", 16x32 VDU; C2000k; 64 cps printer: 4 P/P. Options: dual 5 1/4" F/D (540k) £1610; dual 8" F/D (2.4 Mb) £4108.	Basic (ROM)	Full dot matrix graphics. Complete range of interfaces, peripherals and application packages avail. 16k RAM £142. (S).
HP86 (£1314)	As above	80k RAM: C.P.U.: 48k ROM. Options: 12", 24x80 VDU £238; 9", 16x80 VDU £216; 5 1/4" F/D (207k) £622	ExBasic	Many expansion possibilities including CP/M module (£362), RS232 port (£289) and up to 576k user RAM. 400x240 graphics. BT 10/82 (E)
HP 125 (£2479)	As above	64k RAM: 2xZ80A; 12", 24x80 VDU 2xRS232 ports; HP-1B port. Options: dual 5 1/4" F/D (500k) £1693	CP/M: Basic; Cobol Fortran; Pascal	Integral thermal printer £629. Also available with dual 8" F/D (2 Mb). (S). BT 3/82
IMS 5000 (£1500)	Equinox: 01-739 2387 (20)	16-56k RAM: Z80; dual 5 1/4" F/D (320k); 2xS/P; 1 P/P.	CP/M: C/Basic; Cobol; Fortran.	3 drives option: (S&H).
IMS 8000 (£2500)	As above	64-256k RAM: Z80; dual 8" F/D (1 Mb); 2xS/P; 4 P/P	CP/M: Basic; Cobol; Fortran; MicroCobol.	Multi-user MVT/FAMOS available in place of CP/M. (S&H).
Jupiter Ace (£90 inc VAT)	Jupiter Contab,	3k RAM; 8k ROM: Z80A; 24x32 TV int; C int: loudspeaker.	Forth	Has 140 Forth words defined in ROM.
Kemtron K2000 E (£2300)	Kemtron 0244 21817 (3)	64k RAM: Z80A; single 5 1/4" F/D (150k); 12", 24x80 VDU: 2xS/P; P/P	CP/M: Basic; Cobol; Fortran; Pascal: A	Extensive range of support cards and industrial interfaces.
Kemtron K3000 E (£3300)	As above	64k RAM: Z80A; dual 8" F/D (2Mb); 2xS/P; P/P	CP/M: MP/M; Basic; Cobol; Fortran; Pascal: A	Up to four screens and four printers can be attached. Options: 10Mb H/D.
LSI M-Two (£6000)	LSI Computers 04862 23411 (20)	64-128k RAM: 8085A; dual 8" F/D (1.2 Mb); 12", 24x80 VDU: 60 cps printer	Elsie: CP/M; Basic; Cobol Fortran; Pascal: A; U	Max 8 VDUs and 4 printers. Many applications packages available. Option: 10 Mb H/D £2600. (S).
LSI M-Three (£1700)	As above	64k RAM: Z80A; dual 5 1/4" F/D (350k); 12", 24x80 VDU: RS232 port: P/P	CP/M; Basic; Cobol; Fortran; Pascal: A	Option: Dual 8" F/D, 10 Mb H/D (E)
LSI M-four (£2175)	As above	128-256k RAM: Z80B; 8088; dual 5 1/4" or 8" F/D 3xRS232 ports: RS422 port: P/P; 12", 24x80 VDU	MS-DOS; CP/M-86 Basic; Cobol; Fortran; Pascal; MP/M-86	Operates on either 8-bit or 16-bit applications software. Option: 10 Mb H/D
Macro 1 (£3950 or £294 pm)	Micro APL Ltd. 01-834 2687 (TBA)	64k RAM: Z80A; dual 8" F/D (1 Mb); 4xRS232 ports.	CP/M: APL; U: Basic; Fortran; Cobol; Word- Star Also; Pascal; Forth.	Designed as timesharing replacement. Macro 2 with 2 Mb F/D £4750 or £334 pm.
Marinchip M900 (£4990)	Microprocessor Eng. 0703 775482	128k RAM: 9900; dual 8" F/D (2Mb); 4xRS232 ports.	NOS: Basic; Pascal; W/P; SPL; Forth; Meta	Multi-user/multi-tasking OS. Options: H/D up to 120 Mb.
Micro Trainer 1 (£650)	Hewart: 0625 22030 (N/A)	16-32k RAM: 6800/6809; 10" 16x24 VDU: 2xS/P; Int; Opt: dual 5 1/4" F/D (160k) £595; 8k RAM £17.	Basic: A; Pascal; PL/M; W/P	SS50-based system. Graphics avail. Int card with real time clock £17. (I).
Millbank Sys 10 (£2395)	Millbank: 01-891 4691(6).	65k RAM: Z80; dual 5 1/4" F/D (700k); 12", 24x80 VDU: 2x RS232 ports: RS449 port: P/P.	CP/M: Basic; Cobol; Fortran; Pascal; PL/I; W/P.	12-month warranty. Main- frame comm. package. Maintenance contracts. Options: 1.6 Mb F/D. 5-50 Mb H/D. (S&H)
Munroe EC8800 (£2150)	Fi-Cord Int. 061 445 7716	128k RAM: Z80A; single 5 1/4" F/D (320k); 3xRS232 ports: P/P	Munroe Multitasking System: CP/M; Basic; Cobol; Fortran; Pascal	High res colour graphics. Option: single 5 1/4" F/D. (330k). £495

List of Abbreviations

A Assembler	G/C Graphics card	M/A Macro assembler	S Software
BT Bench Tested	H Hardware	N/A Not available	S/P Serial port
C Cassette	H/D Hard disk	N/P Numeric pad	T/E Text editor
E Extensive	I Introductory	O/S Operating system	TBA To be announced
F/D Floppy disk	Int Interface	P/P Parallel port	U Utility

Please note: Software items listed in *italics* are not included in the basic price of the equipment. All prices are exclusive of VAT.

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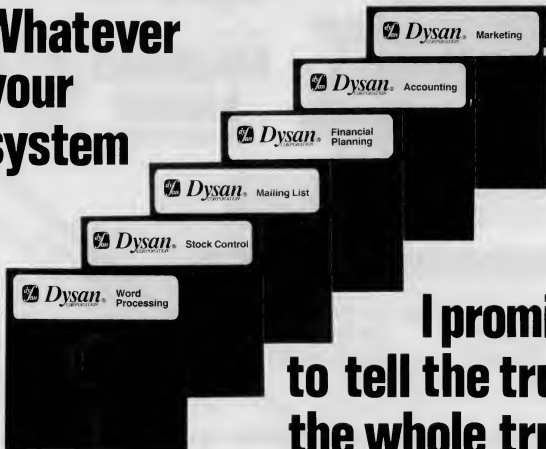
Machine (Price from)	Main Distributor/s (No. of Dealers)	Hardware	Software	Miscellaneous (Documentation)
Munroe OC8820 (£2990)	As above	128k RAM; Z80A: dual 5 1/4" F/D (640k); 9", 24x80 VDU: 3xRS232 ports: P/P	As above	5MB H/D avail soon. BT 4/82.
Nascom 3 (£549)	Lucas Logic 0926 59411	48-60k RAM; Z80: dual 5 1/4" F/D (700k); RS232 port: P/P.	Basic: <i>Pascal: A: CP/M: Cobol Fortran</i>	Options dual 5 1/4" F/D (700k) £685; 48k RAM £130.
NEC PC 8001 (£599)	IBR 0734 664111	32k RAM; Z80A: P/P Option: dual 5 1/4" F/D (326k) £699	Basic N; (24k ROM) <i>Pascal: Fortran: Cobol: Pascal.</i>	Colour monitor £359 (low res) or £579 (high res) both 12", 25x80 many expansion units avail. (E) BT 6/81
Newbrain Model A (£199)	Grundy: 0223 350355 (TBA)	32k-2 Mb RAM; Z80A; Nat 420; 2x C int: TV int: 2xV24 ports.	CBasic (29k ROM): A.	Graphics. Battery or mains. Options: 1/2 Mb RAM £450. Also Model AD £299.(E).
North Star Horizon (£1975)	Comart: 0480 215005. (25) Trader Comp. 01-328 3484 (60)	32-64k RAM; Z80A: dual 5 1/4" F/D (360k); 15", 24x80 VDU: 150 cps printer: 2 S/P: 1 P/P.	DOS: Basic: CP/M: Cobol: Fortran: Pascal.	Options: 5-18 Mb H/D, Multi-user.
North Star Advantage (£2195)	As above	64k RAM; Z80A: dual 5 1/4" F/D (720k); 12", 24 x 80 VDU: S/P.	GDOS: CP/M: CBasic: MBasic: Fortran: Cobol: Pascal	Price includes business graphics & demo software.
Ok! if 800 (£3000)	Encotel. 01 686 9687	64k RAM; Z80A: 2k ROM: dual 5 1/4" F/D (768k); 12", 24x80 VDU: 80 col printer: loudspeaker: RS232 port: 20k ROM cartridge.	Basic: A: CP/M Cobol: Fortran:	Fully integral unit. Graphics. Options: dual 5 1/4" F/D (560k); RS232 port: PP. (1). BT 10/81
Olivetti M20 (£2395)	Olivetti 01 785 6666	128k-512k RAM; Z8001: 2-8k ROM: dual 5 1/4" F/D (640k); RS232 port: P/P	Basic: PCOS: A	Alternative 8086 processor board to run CP/M & MS-DOS. Options: 11 Mb H/D (integral) printer £738. (S) B/T 9/82
Onyx C8000 (£6875)	Onyx Dist Ltd: 09066-5432 (TBA)	64k RAM; Z80: 12 Mb Cartridge: 10 Mb H/D: 4 S/P: P/P	CP/M: MP/M Oasis: Unix: Fortran: Pascal: W/P	C8001 with 128k RAM £8220. Multi-user version avail. using Oasis.(E) BT 3/81.
Oric 1 (£100 inc VAT)	Oric Products Int 0990 27641	16-48k RAM; 6502A: 28x40 TV int: C int: S/P: P/P: Loudspeaker	Basic (16k ROM): Forth	With 48k RAM and Forth on cassette £170 inc VAT. 240x200 colour graphics. Micro disk and modem avail soon. Viewdata compatible.
Osborne 1 (£1250)	Osborne 0908 615274(40)	64k RAM; Z80A: dual 5 1/4" F/D (200k); 5", 24x52 VDU: RS232 port: P/P	CP/M: W/P: Cobol Fortran: Pascal CBasic: MBasic: Wordstar: Mailmerge: Supercalc: Forth	Integral system in weatherproof carrying case. Will run on battery pack. Option: dual 5 1/4" F/D (400k). BT11/81.
Oscar (£2560)	IDS Ltd: 0908 313997(30)	64k RAM; Z80: dual 5 1/4" F/D (800k); 12", 25x80 VDU: RS232 port: 1 P/P	CP/M: Basic: Pascal Fortran: Cobol: W/P:A	Also avail. with dual 5" F/D(1.6Mb) £2905 and 8" F/D £3380. Advanced video board. S&H.
Panasonic JD 800M, JD850M (£3300, £4350)	Panasonic Business Equipment: 0753 75841 (10 regional dist)	64k RAM; 8085A: 4k PROM: dual 8" F/D JD800M (500k); JD850M (2 Mb); 12", 24x80 VDU: 3xRS232 ports. P/P	CP/M: Basic: A Micro-Cobol.	Option: 8.4 Mb H/D £2725 (up two). BT3/80(S).
Pascal Microengine (£2295)	Pronto Electronic Systems Ltd: 01-554 6222	64k RAM; MCP 1600: 2x RS232 ports: 2 P/P.	Pascal.	CPU instruction set is P-code: no interpreter needed. Avail- able with dual 8" F/D (2 Mb) £3900.
Pasca 640 (£1900)	Westrex Ltd: 01-578 0957 (TBA)	64k RAM; Z80A: dual 8" F/D (512k); 12", 24x80 VDU: RS232 port: P/P	CP/M: Basic: Cobol: Fortran: Pascal: A: W/P: U	Maintenance contracts avail. Option: 5-20 Mb H/D. (S) BT 5/18
Philips P2000 (£2444)	Philips Data	16-48k RAM; Z80: dual 5 1/4" F/D (140k); 12", 24x80 VDU: RS232 port.	PDOS: UCSD P-system: Pascal: Basic Fortran: A.	With 48k RAM, Pascal and Basic £3300; BT 12/81.(S).
Position 900 (£1950)	Position Comp. 09252 29741 (10)	64-512k RAM; 6809: 4xRS232 ports: IEEE-488 port: 1200 baud C: dual 5 1/4", F/D (720k)	OS-9: Basic 09: Pascal: C: A: Cobol: U FLEX O/S	Supports 4 users, expandable to 8. Networking allows 28 users on 7 Options dual 5 1/4" F/D (1.4 Mb): 5-40 Mb H/D (E)
Position 9000 (£1536)	As above	64-512k RAM; 6809: 4xRS232 ports: IEEE-488 port: 1200 baud C.	OS-9: Basic 09: Pascal C: A: Cobol: U	240x240 high res colour graphics. Viewdata compatible. Disk options as above. Supports 5 users. Networking allows 35 users on 7 systems (E) BT 10/82.
Prince (£3045)	Digico: 04626 78172 (50)	64k RAM; 3xZ80A: dual 5 1/4" F/D (800k); 2xRS232 port: P/P 12", 25x80 VDU	CP/M: Basic: Pascal: Fortran: Cobol: W/P:A: T/E:U	High res graphics. Options: single 5 1/4" F/D (400k) £600: dual 8" F/D(2Mb) £2000 5-10Mb H/D. Rentals avail. (S).
Quantum 2000 (£2250)	Quantum Comp Sys 0532 458877	64k RAM; Z80A: dual 8" F/D (2.4Mb); 12", 24x80 VDU: C int: P/P	CP/M: Basic: Cobol: Fortran: Pascal: A	Many expansion boards avail inc high res colour graphics. Option: 5-10Mb H/D.
Rair Black Box 3/30 (£3750)	Rair: 01-836 6921 (N/A)	64-512k RAM; 8085: dual 5 1/4" F/D (500k); 5 Mb H/D: 2xRS232 ports.	CP/M: Basic: Cobol: Fortran: M/A	64k RAM expansion £500. 256k RAM £1250. Up to 16 RS232 ports.
Research Machines 380Z (£1867)	Research Machines: 0865 249866 (N/A)	32-56k RAM; Z80A: dual 5 1/4" F/D (300k) RS232 port. P/P.	ExBasic: A: T/E: U: CP/M: Fortran: Cobol: Allego: Pascal.	High res colour graphics. Many possible systems. With 56k RAM & dual 8" FD (1 Mb) £3347.
Research Machines Link 480Z (£560)	As above	32-64k RAM; Z80A: C: 2xS/P: P/P	Basic: T/E	High res colour graphics. Network station.

List of Abbreviations

A Assembler	G/C Graphics card	M/A Macro assembler	S Software
BT Bench Tested	H Hardware	N/A Not available	S/P Serial port
C Cassette	H/D Hard disk	N/P Numeric pad	T/E Text editor
E Extensive	I Introductory	O/S Operating system	TBA To be announced
F/D Floppy disk	Int Interface	P/P Parallel port	U Utility

Please note: Software items listed in *italics* are not included in the basic price of the equipment. All prices are *exclusive* of VAT.

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IN STORE

Machine (Price from)	Main Distributor's (No. of Dealers)	Hardware	Software	Miscellaneous (Documentation)
Sage II (£2870)	TDI 0272 742796	128-512K RAM: 68000; single 5¼" F/D (320k); VDU int: RS232 port: P/P	UCSD p-System: Pascal Basic: Fortran: M/A	Price includes 1 year service. With 512k RAM and dual 5¼" F/D (1MB) £4594 BT 2/83
SEED System 1 (£1900)	Strumeh: 05453 78151 (5)	32-56k RAM: 6800; various disk options: 12", 24 x 80 VDU: RS232 port: P/T	DOS: Basic: M/A: CBasic: A: T/E	Graphics. PROM programmer also system 19 multi-user (£3000). (E)
Sharp MZ-80K (£460-34k)	Sharp Electronics (UK) Ltd: 061-205 2333 (22)	6-48k RAM: Z80: C: 10" 24 x 40 VDU: Option: dual 5¼" F/D (289k) £695	Basic, A. CP/M: Pascal: Fortran: Forth	Graphics: loudspeaker. BT 10/79 (B)
Sharp MZ80A (£549)	Sharp Electronics (UK) Ltd 061 205 2333 (22)	48k RAM: Z80: 25x40 VDU: C: P/P. Options: single 5¼" F/D £400; dual 5" F/D £590: RS232 port	Basic: CP/M: A: Pascal: Fortran: Cobol	Expansion unit needed for disks (£100) Low res (80x50) graphics. Loudspeaker Numeric pad (B)
Sharp MZ-80B (£1095)	As above	64k RAM: Z80A: C: 9", 25 x 80 VDU: RS232 port: P/P.	Basic: A: Pascal: FDOS	High res graphics. Options: dual 5¼" F/D (560k) £800: 80 cps printer £415. (S)
Sharp PC1500 (£1510)	As above	3-11k RAM; CPU: 16k ROM: 26 char LCD:	Basic	Full system with dual cassette int. and miniature four colour plotter £375. RS232 port avail. soon. (B). BT 6/82
Sharp PC3201 (£2995)	As above CP/M: Cobol	64k RAM: Z80A: dual 5¼" F/D (500k); C int: 12", 25 x 80 VDU: 70 lpm printer.	DOS: U: Basic: CP/M: Cobol.	Various expansion cards avail. BT 7/81 (8k)
Sharp PC1251 (£80)	As Above	3k RAM: 8-bit CPU: 24 char LCD	Basic (24k ROM)	Portable. Printer/cassette unit £100 BT 2/83
Sig/Net 100ZS (£1299)	Shelton 01 278 6273 (5)	64k RAM: Z80A: dual 5¼" F/D (400k); 2xRS232 ports	CP/M: Basic: Cobol: Fortran: Pascal	Various disk options, up to 16 Mb H/D
Sinclair ZX81 (£50 inc VAT)	Sinclair: 0276 66104 (300+)	1-16k RAM: Z80A: C int: TV in: full K/B: 44-pin expansion port.	Basic (8k ROM).	Advanced 4-chip design. Printer now avail. BT 6/82
Sinclair ZX Spectrum (£125 inc VAT)	Sinclair: 0276 685311	16-48k RAM: Z80A: 16k ROM: T.V. int: C int	Basic	Options: 32k RAM £60. RS232 port and microdrive disks avail soon. BT 6/82
Smoke Signal Chiefan (£1800)	Windrush 0692 405189: (TBA)	32-64k RAM: 6800/6809: dual 5¼" F/D (500k): 2 x RS232 port.	DOS: 68/FLEX: Basic: Fortran: Cobol: A: Disc A: Pascal: U.	With dual 8" F/D (2 Mb) £2600. Designed as development system for industrial control. (H).
Sorcerer (£790)	EMG 0293 519211 (27)	48k RAM: Z80: RS232 port: 1 P/P: S100 connector: 30x64 VDU int. N/P.	O/S: Basic (ROM): A: Algol: Fortran: MBasic: ExBasic: 80. Pascal: W/P.	High-resolution graphics capability: user programmable character set. Option: single 5¼" F/D (316k) £600 Video disk unit (£150) £1890
Sord M100 ACE (£2339)	Midas Computer Services Ltd: 07917 64846 (10)	48k RAM: Z80: 8k ROM dual 5¼" F/D (245k); 24 x 64 green VDU: RS232 port: N/P	O/S: Basic: A: Fortran: Pascal: Cobol	Up to 3 drives possible. Colour graphics avail. Option S100 bus. (I)
Sord M223 Mk II-VI (£4078)	As above	64k RAM: Z80: 8k ROM: dual 5" F/D (700k); 12", 24 x 80 green VDU: RS232 ports: S100 bus: N/P	O/S: Ex Basic: CBasic: Multi-User Basic: Fortran: Cobol	Expandable to 4 Mb F/D. 32 Mb, H/D, 5 screens, 2 printers, M243 with 192k RAM & 1.4 Mb F/D £5087.
SPC/1 (£1340)	Digital Data: 01-573 8854	96-1056k RAM: 8085 A-2: dual 5¼" F/D (280k); 12", 24 x 80 VDU: 2 x RS232 ports: Option: Up to 106 Mb H/D	Mikados, Comal: Pascal: A.	Expandable to multi-user system (8 users). BT 7/80 (S).
Superbrain (£1750)	Icarus: 01-485 5574 (45)	64k RAM: 2 x Z80: dual 5¼" F/D (320k); 12" 25 x 80 VDU: 2 x RS232 port.	CP/M: A: Basic: Cobol: Fortran: APL: Pascal	Limited graphics. Mainframe int avail. With 676k F/D £2090, 1.5Mb £2345. With 5Mb H/D & single 338k F/D £3950. BT 8/80. (S&H)
SWTPc/09 (£3850)	SWTP Ltd 0733 234433	64k RAM: 6809: dual 5¼" F/D (1.5Mb) 2 S/P: P/P: 12", 24 x 80 VDU	Flex O/S: Basic: A: T/E	Expandable to 768k RAM
SWTPc/S/09 (£7000)	As Above	128k RAM: 6809: dual 8" F/D (2.5Mb) 2 S/P: 1 P/P	Uniflex O/S: Cobol: Basic: Fortran: C: Pascal: A: Plot: Forth.	Up to 80MB H/D. Multi-user, multi-tasking, up to 18 users
System 10 (£2995)	Millbank 01-788 1083 (TBA)	64k RAM: Z80: dual 5¼" F/D (700k); 12", 24 x 80 VDU: 2 x RS232 port: P/P	CP/M: Basic: Fortran: Pascal: Cobol: PL/1: W/P	12 month warranty. Maint. contracts. Applications packages avail. Choice of high level language in price. (E)
Tandberg EC10 (£3250)	Tandberg: 0532 774844 (N/A)	65k RAM: 8080 A: single 8" F/D (250k); 12" 25 x 80 VDU: 7 x RS232 ports: printer int.	CP/M: Ex Basic (24k) Multi-user Basic: Pascal: Cobol: A: U:	Up to 7 terminals. Includes V28 comms port. (S&H)
Tandy PC-2 (£179 inc VAT)	As above	3-11k RAM: CPU: 16k ROM: 26 char LCD	Basic:	System with dual cassette int. and miniature four colour plotter £338 inc VAT. RS232 port avail. soon. (B)
Tandy TRS-80 Model I (£174)	Tandy: 0922 648181 (200)	16-48k RAM: Z80: C: 12", 16 x 64 VDU: RS232: P/P	Basic (12k ROM); A.	Fully expandable. Option: single 5¼" F/D (175k) £320 (up to 4). Many extras available. 32k RAM £260. (I)
Tandy TRS-80 Model II (£2347)	As above	64k RAM: Z80: single 8" F/D (500k) 12" 24 x 80 VDU: 2 x RS232 port: P/P	Basic M/A Fortran: Cobol 3-32 Mb H/D	Option: single 8" F/D (500k) £782 (subsequent £391, up to 4). 8-32Mb H/D
Tandy TRS 80 Model 3 (£434-£1477)	As above	See Model I Levels I and II		Fully integral unit. Up to 2 integral and 2 external 5¼" F/D. BT 8/81

List of Abbreviations

A Assembler	G/C Graphics card	M/A Macro assembler	S Software
BT Bench Tested	H Hardware	N/A Not available	S/P Serial port
C Cassette	H/D Hard disk	N/P Numerical pad	T/E Text editor
E Extensive	I Introductory	O/S Operating system	TBA To be announced
F/D Floppy disk	Int Interface	P/P Parallel port	U Utility

Please note: Software items listed in *italic* are not included in the basic price of the equipment. All prices are exclusive of VAT.

IN STORE

Machine (Price from)	Main Distributor/s (No. of Dealers)	Hardware	Software	Miscellaneous (Documentation)
Tandy TRS-80 Colour (£209)	As above	16-32k RAM; 6809; 8-16k ROM; C: 16 x 32 TV int; RS232 port.	Colour Basic.	With 16k RAM, 16k ROM & Extended Colour Basic £261 (1). BT 9/81.
Tandy TRS-80 Model 16 (£3651)	As above	128-512k RAM; Z80A 68000; dual 8" F/D (1-2Mb); P/P; 2xRS232 port.	TRSDOS: A: <i>Cobol</i> Basic	Will run all Model 11 software. System with single 5 1/4" F/D (600k) and 8Mb H/D £5911. Options: 8Mb H/D £2173 (up to four); 640x240 high res graphics; Multi-user system avail. soon. (S)
Tele Video TS800 (£3100)	Colt 01-577 2686	64k RAM; Z80A; dual 5 1/4" F/D (700k); P/P; S/P; 24x80 VDU; 80 cps printer.	CP/M; Basic: <i>Cobol</i> ; <i>Fortran</i> ; <i>Pascal</i>	Fully expandable to local area network with 16 users. 8 and 16 bit versions avail. and full set of application software. (S)
Terotec PBM-1000 (£4020)	Terotec: 0734 664343 (40)	80k RAM; Z80A; single 5 1/4" F/D (819k); 6Mb H/D; 2xS/P; P/P	CP/M CP/Net CBasic; <i>Fortran</i> ; <i>Pascal</i> ; <i>Cobol</i>	Work with Okidata 80 printer; TV 1 910 VDU; W/P and various application packages £595 (S&H)
T1 99/4A (£199 inc VAT)	TI: 0234 67466 (TBA)	16-48k RAM; 26k ROM; 9900: 2 x C int; 24 x 32, 16 colour TV int; 3 tones & noise; P/P.	OS: Basic.	12 month guarantee. Options 32k RAM; 2 x RS232; 3 x 5 1/4" F/D (92k each); Speech Synthesiser.
Torch (£12795)	Torch Comp. 0223 841000 (30)	64k RAM; Z80A; dual 5 1/4" F/D (800k); 12", 24x80 colour VDU; RS232 port; P/P; Modem	CP/N: BBC Basic;	O/S is CP/M compatible. With 21MB HD and single F/D £5495, B/T 1/83
Tuscan CP/M Starter (£999)	Transam: 01-405 5240 (N/A)	24k RAM; Z80; single 5 1/4" F/D (190k); Clint: TV int; RS232 port; P/P; N/P.	CP/M; Basic: <i>Fortran</i> ; <i>Pascal</i> ; <i>Cobol</i> ;	Options: single 5 1/4" F/D (190k) £155; single 5 1/4" F/D (370k) £285; 16k RAM £162; 3 Mb H/D £1450; 20 Mb H/D £2970 (S&H)
Tuscan Starter Kit (£299)	As above	8k RAM; Z80; Clint: 56-key K/B Options: Case £110; 5 x S100 sockets £20; TV int £3.50	8k Basic	Fully assembled version £499 BT 1/81 (H&S)
Vector MZ (£2650)	Almarc: 0602 52657 (3)	56k RAM; Z80A; dual 5 1/4" F/D (630k); 3 S/P; 2 P/P.	CP/M; Basic: <i>Algol</i> ; <i>Cobol</i> ; <i>Pascal</i> ; <i>Fortran</i> ; <i>Coral</i> ; CBasic: A.	High resolution graphics. Also system B with video board & terminal £3450. (E)
Vector System 2800 (£4600)	As above	56k RAM; Z80A; dual 8" F/D (2.4 Mb); 3 S/P; 2 P/P	As above	High-res graphics. Many Options. Fully expandable to 5005 multi-user system (max 5) £5400.
VIP (£2650)	Almarc 0602 52657 (3)	64k RAM; 3k ROM; Z80B; single 5 1/4" F/D (630k); 12", 24 x 80 VDU; RS232 port; 3 x P/P	CP/M; Basic: <i>fortran</i> ; <i>Cobol</i> ; <i>Fortran</i> ;	Up to 3 additional F/D drives. Options: dual 8" F/D (2 Mb) £1063, 32 Mb H/D (TBA). (H&S). BT2/81
Windrush 6809 (£2418)	Windrush 0692 405189	56k non-volatile CMOS RAM; 6809; 2xRS232 ports; 2xP/P; dual 5 1/4" F/D (700k)	OS-9: <i>Flex</i> ; <i>Uniflex</i> Basic: A; <i>PL</i> ; <i>SPL</i> ; M; <i>Cobol</i> ; <i>Fortran</i> ; <i>Pascal</i>	Designed as development system for industrial control/computer station for commercial OEM's. With dual 8" F/D (2 Mb) £2953. (E)
Xerox 820 (£1845)	Business Comp Sys 01 207 3344	64k RAM; Z80; single 5 1/4" F/D (162k); 12", 24 x 80 VDU; 2 x RS232 ports; P/P	Monitor: CP/M; Basic: <i>Cobol</i> ; <i>Fortran</i> ; <i>Pascal</i> ;	With 8" F/D (500k) £2250. CP/M £95. BT 1/82 (S+H)
Zenith WH-11A (£2673)	Zenith Data Systems 0452 29451 (TBA)	LSI 11- 16-32k RAM; 25 x 80 VDU; S/P; P/P.	O/S: Basic, <i>Fortran</i> ; A: U.	PDP 11-compat. Option: 2 x 8" F/D (1 Mb). £1717 (S&H).
Zenith Z89 £1570-£1710	As above	16-48k RAM; Z80; single 5 1/4" F/D (102k); 12" 24 x 80 b&g vdu; RS232.	Basic: A: <i>HDOS</i> ; Basic: MBasic; CBasic: <i>Fortran</i> ;	3 x 5 1/4" F/D possible. Options: dual 8" F/D (1 Mb) £1717, 20 Mb H/D.
Zilog MCZ 1/05 (portable); MCZ 1/20A (£3250)	Thames Systems: 084421 5471 (N/A)	64k RAM; Z80; dual 8" F/D (600k); RS232 port; MCZ1/20A only 1 P/P; Option: 10 Mb H/D £7100	RIO: O/S: <i>Cobol</i> ; Basic: <i>SPL</i> ; <i>Fortran</i> ; <i>Pascal</i> ; M/A: U.	Available desk top or rack mounted. Debug in 3k PROM. 1/20A runs multi-user COBOL, up to 5 terminals with 40 Mb H/D. (S&H).

ACC NEWS

Rupert Steele presents his monthly round-up of news from the
Amateur Computer Club.

Two important telephone-related meetings have occurred recently, one about bulletin boards and one about Prestel. But wait a minute, you say, what is a Bulletin Board? Read on...

The idea of a bulletin board is that, on the end of a phone line, there is a computer which people can talk to via a modem. The computer gives each user an identity, and they can leave messages for each other, or for a wider audience. Typically they operate at 300 baud and run unattended; there is a privileged user, or system operator, who can give special commands to help

keep the system going. Ideally, the machine should automatically re-boot in the case of power (or other) failure.

Earlier this year there was a meeting in the restaurant of Manchester Airport attended by the system operators of many of the country's bulletin boards. The meeting agreed to set up AFPAS (Association of Free Public Access Systems) as an organisation to handle proposals for common standards and inter-board liaison. Other functions for the association were to promote the distribution of public domain software, and to

promote both bulletin boards, and data communications in general.

On standards there was some progress, and from 1 May this year all bulletin board systems in the UK are expected to support the following protocol: ASCII, 7 data bits, even parity, 1 start bit, 1 stop bit, asynchronous. Optionally XON/XOFF support may be included (with timeouts to protect the board), as may a file transfer mode via the 'modem' protocol. The Secretary of AFPAS, elected at the meeting, will be Fred Brown on 421 Endike Lane, Hull HU6 8AG.

The boards that belong to the association are:

CBBS NE (19.00 — 0.00)
0207 32447;

Bettisfield remote CP/M
(13.00 — 17.00/19.00 —

23.00) 094-875 378;

Mailbox 80 Liverpool (9.00 —

17.00/19.30 — 22.00/
12.30 — 22.00 weekends)

051-220 9733;

London local (22.00 —

01.00) 01-348 6518;

Forum 80 Hull (Tue/Thu
19.00 — 22.00; Sat/Sun
12.00 — 22.00) 0482-859

169;

CBBS London 01-399 2136.

The number of Mailbox 80
Liverpool may change, but the

ACC NEWS

new number will be posted on Forum-800 Hull. All of the above run at 300 baud, CCITT V21 standard.

Meanwhile, on the Prestel front, the Club Spot 800 is now up and going. The editors' conference, held in Watford at the end of February, proved to be a great success, with all the places taken; in fact we were over-subscribed, so there may well be a repeat Club Spot editors' conference elsewhere in the country.

The meeting was introduced by David Babsky, the editor of Micronet 800, and there was a session on the technicalities of editing, given by Tony Sweet of BT Prestel. There was a successful, though probably too short, 'hands-on' editing session, and then a talk by Vernon Quaintance of the ACC National Prestel Committee on the organisation of Club Spot.

The Club Spot is ultimately run by the ACC National Prestel Committee on the organisation of Club Spot.

The Club Spot is ultimately run by the ACC National Prestel Committee, which has recently been enlarged to take on representatives of the national user groups and local clubs. Representatives from BASIG, ICPUG and the Merseyside area were elected; finally our thanks are especially due to Stephen Rabagliati and IGD for providing such an excellent venue for the conference.

By the time this appears in

print, the editors will have been beavering away for some time, and there should be quite a bit of material in the Club Spot for you to look at. Club Spot 800 is of course on *8008#, part of the Micronet 800 area. If you've got Prestel (either directly or via Micronet), why don't you have a look and tell me what you think? And, of course, if you want to edit material up on Prestel, then get in touch with me about becoming an editor.

It must be over a year since the last Club was featured, but the Coventry Computing Circle looked so interesting that I thought they deserved more than a simple mention. The club, which boasts no less than 330 members, is run by Chris Baughan, of 9 Hillman House, Smithford Way, Coventry, CV1 1FZ. His phone number is 0203 25802 (evenings).

There is no membership charge for the club, the only requirement being an 'interest in computing'. The club newsletter is computerised, and lives at Mr Baughan's computer sales business. The member contribute to the contents of the newsletter by keying in their item, but it an enquiry seeking an answer, a program they've written that they wish to share, an item wanted or for sale, or anything else that they see fit.

The newsletter is printed out on request, but the computer program remembers which pages have been printed

on behalf of which members and will ensure that only items entered since the last print-out for that member will be printed out this time. The group does not, as yet, have formal meetings, though Chris says that he is able to organise these, should his members want them. The idea would be to have 'interesting people' coming to chat, rather than a more formal lecture.

The emphasis of the whole set-up is on informality, with a loosely defined free membership; the contrast with tightly formalised clubs such as OPeCC (the Oxford Personal Computer Club) is quite interesting; both organisations are very successful, despite the completely different approach to running the club.

There is a burst of activity in the Bedford and Luton area this month. A Mr D Buckingham, of 83 Neville Road, Limbury, Luton LU3 2JG (phone Luton 570125) has started 'The Dragon's Den', a new independent national user group for the Dragon microcomputer.

A Mr Stephen Betts, who was late for the Club Sport 800 Conference, having been delayed as a result of losing his shirt, is the Secretary of the Chiltern Home Computer Club (do not confuse this with the separate Chiltern Computer Club). His address is 42 Wallace Drive, Eaton Bray, Beds LU6 2DF. They are a general club, with interests in many machines, so if you live in the area why not drop him

a line for the details of the next meeting.

Mr Rowan Bird also runs a club in the same general area, but further north. He is the secretary of the Bedford Amateur Computer Club, and his address is 7a High Street, Great Bedford, Beds, MK44 3LB. The club has now been running for two and a half years. They meet twice a month, on the first and third Tuesday, with a formal lecture or visit on the first Tuesday and something more informal on the third. The meetings are held at Bedford Star Rowing Club at 8pm, and the subscription is three pounds with reductions for students.

Scotland is once again the source of much computer clubbery. A Mrs Annette Johnston tells me that she is secretary of the Stonehaven Computer Club, and she lives at 7 Dunnottar Avenue, Stonehaven, Kincardineshire, Scotland, AB3 2JD. Also in these northern parts is the Scottish TRS-80 user group. The chap to contact there is Mr Dick Mackay, on 031-229 6032, and the meeting place is Mansion House Hotel, Wilton Road, West Edinburgh. Meetings are on the second Thursday of each month.

Details of the ACC and Club Spot 800 can be obtained from: Rupert Steele, St John's College, Oxford, OX1 3JP. Tel: Oxford (0865) 512811.

TRANSACTION FILE

Readers will be pleased to know that, due to our clever layout ideas, the Transaction File is up-to-date and waiting cut down considerably. Ads are accepted only on the form below for a flat fee of £2.50. Please don't specify issues as we can't oblige. Ads cannot be repeated unless separate forms are sent in. We will only accept entries from non-commercial readers. Thank you for cooperating.



- Olympia ES100 Daisy-wheel KSR with built-in RS232 interface and off-line keyboard, typewheels £400. Spreadsheet programme on CBMR05. Dork £155, Dallas, 28 Gordon Mans, Tottenham Place, London WC1F 7HE. 01-606 2523.
- S100 — Morrows 8in controller/drive CP/M, M/Basic £400, 5Mb mini Winchester/controller CP/M £1000; Hitachi 320x250 colour graphics board/software £315; CP/M Usergroups' disks, 64 Chamberlain Cwasy (0293) 512101.
- Must clear: 3in North Horizon, 50k, RAM, DS/DD drive, DOS/Basic, CP/M, £1300. Lear Siepler, ADM42 15in VDU £350, Ecom MX42FT printer £275, 8k RAM boards £29. Crawley (0293) 512101.
- Apple II+ Disk and controller

- card, RAM card, TV modulator + many many programs £1200. Tel: 0279 57961.
- TRS80 Model I Level 2 16k, VDU, cassette covers original packages, £100 of s/w are including Touch Typing. All for £295 ono. Contact 01-242 7475.
- Apple IIe Europa as new £400, VDU £40 write to P Waudby, methodist international house, 52 Oakfield Rd, Selby Park, Birmingham (sorry no telephone). First adequate offer secure.
- Osborne one micro with Wordstar, manager, CP/M, super-calc: Basic complete with instruction book. Perfect working order. As new costs £1250. V.A.T. Will sell for £950. No V.A.T. Reading 744303.
- Tekes TR9/4A, only 2 months old with cassette cable and T

- Invaders bought for £250 sell for £200, 9 Rawnsley house, Manchester Road, Bradford BD5 7LE, Yorkshire after 4pm.
- Acorn Atom fully expanded + 6000 baud digital cassette, 17k syncard, Atomcard, wordstar, ROMs, ROM selector board, Hitachi monitor, £400 will split. Cambridge 0223 355957.
- Microtan 65, Expanded Tanex, Basic, New Xbug, Tanbug V2, Toolkit, Minibook, MP51, manuals, £110. System motherboard, 39k Tanram unused £50. Tanbug floppy tape for TRS-80 L II. Hardly used £70. HP32-E scientific calculator, mint £12. Write JS Trustwin, Flat 5, Elmfield Court,

- East Road, Maidenhead, Berks. SL6 1PN.
- TRS80 MOD 3 business system, line printer V1, 64k shuffleboard CP/M system, (current hands-on cost £2300); super script, VisaCalc, profile 3.2, WordStar, 50 disks crammed with software, no place Tel: 06755 2745.
- UK10 8k RAM with MONO2, software and literature. Fully working £100. CB with serial £50. Fully working. Accept any reasonable offer for either. Tel: Richard on Potters Bar (0707) 51449.
- Acorn Atom 64k RAM, 12k ROM, F/gint, toolkit, wordpack, + books and s/w are £220 ono. Tel: Fawcett and Crosby, Manchester 061 832 4542 office hours or 061-747 8822 eve.
- Sharp MZ80K 48k RAM in

- original packing. Manual, Sharp Basic, Space Invaders, Obello 4-D, Newsletters + computer magazine collection £320 Dendford (0322) 845779 eve.
- Osborne I, single density drives, CP/M, Wordstar/Multimerge, Super-calc, MBasic, Diagnostic Test programs, CBasic, the lot for a bargain price of £950, in exc cond. Tel: Anthony 01-440 2403.
- Apple IIe Z80-card, 80 column card, CP/M system disk, the lot for £195, printer (Centronics) interface card and cable £75. Osborne I computer £950. Tel: Anthony 01-440 2403.
- VIDEO GENIE EG3003 16k. Over £70 of s/w are worth lots of games. Original manuals held and packing, £230. No Tel: 021-706 8640 after 4pm.

TRANSACTION FILE

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London SE25 6LH

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NETWORK NEWS

*These are all the European networks of which
we're aware. Most are free — but phone them for details.*

Forum-80 Hull ... (Forum-80 HQ)
Tel: 0482 859169. System operator:
Frederick Brown. International
electronic mail, library for
up/down loading software.
Forum-80 Users Group, Pet Users
section shopping list system hours,
7 days a week midnight to 8.00am,
Tues/Thurs 7.00pm to 10.00pm
Sat/Sun 1.00pm to 10.00pm.

Forum-80 London ... Tel: 01-747

3191. System operator: Leon Jay.
Electric Mail, library for
downloading. System hours:
Tues/Fri/Sun 7.00pm to 11.00pm.

Forum-80 Milton ... (TRS-80
Users Group 80-Net) Tel: 0908
566660. System operators: Leon
Heller and Brian Pain. Electronic
mail, library, newsletter, TRS-80
information system hours: 7 days a
week 7.00pm to 10.00pm.

Forum-80 Holland ... Operator:

Nico Karssemeyer, Tel: 01 313 512
533. Facilities: electronic mail,
program up/downloading,
shopping list. Hours: Tues-Sat
1800-0700 nightly, continuous from
1800 Sat-0700 Tues.

CBBS London ... Operator: Peter
Goldman, Tel: 01-399 2136.
Facilities: electronic mail, program
downloading. Hours: Wed
0700-0930 & 1900-2200, Fri
1900-2200, Sun 1600-2200.
Mailbox-80 Liverpool ... 051-220

9733. System operator: Peter
Toothill. Electronic mail, down-
loading TRS-80 information.
ACC ... members bulletin board,
Peter Whittle (0908 44262).

ABC-80 ... Stockholm (Sweden).
Tel: 010-468 190522.

University Research Computer ...
Sweden. Tel: 010-468 23660, guests
use password "66,66" for access.

Eifa ... Sweden 010-468 7300 706.

Tree Tradet ... Sweden 010-468
190522.

DIARY DATA

*Readers are strongly advised to check details with exhibition organisers before making
arrangements to avoid wasted journeys due to cancellations, printer's errors, etc.*

Manchester	(Midland Hotel), Manchester Home Computer Show, Contact: ASP Exbns, 01-437 1002	22-24 April
Birmingham	(Bingley Hall), Midland Computer Show, Contact: IPC Exbns, 01-643 8040	28-30 April
London	(Bloomsbury Crest Hotel), RIBA Computer Conference, Contact: RIBA Service Ltd, 01-637 8991	10-12 May
London	(Wembley Conference Centre), Satellite and Cable TV, Contact: Online Conferences Ltd, (09274) 28211	10-12 May
Bristol	(Micro City Exbn Complex), Computers, Bus Systems « Communications Exbn, Contact: Tomorrows World Exbn Ltd (0272) 292 156	10-12 May
Southampton	(Post House), Computer Open Day Exbn, Contact: Crouchmead Communications Ltd 01-778 1102	12 May
London	(Conard International Hotel), Computer Trade Exbn, Contact: BED Exbns Ltd 01-647 1001	17-19 May
Glasgow	(Kelvin Hall), Computer, Peripherals, « Systems Exbn, Contact: IPC Exbn Ltd 01-643 8040	17-19 May

Mobre on Kuma



HX-20 Software Delights

Our Epson HX-20 authors have been prolific in the past few months and we now have nine programs including the following suite called the Desk Master Series: 1. Office Aid, 2. Wordprocessor, 3. Spread Sheet Calculator, 4. Friendly Terminal, 5. Electronic Mailbox, and 6. Decision Maker. Some of these plus other HX-20 programs are described below.

OFFICE AID turns the HX-20 into a calculator, adding up lists of figures and printing them out to 16 digit accuracy. It also has a clock/calendar facility (£29.50 plus VAT). **WORDPROCESSOR** is specifically designed for the HX-20 miniature printer with the option to go full size on a larger printer if required. It's an easy to use tool costing £29.50 plus VAT.

HOME BUDGET allows the user to keep track of mortgage, rates, credit card, rentals, heat/light, car/travel and all other kinds of personal and household expenses. Just the tool at £17.35 plus VAT to find out where all your money goes.

HORSE RACE FORECASTING is for the serious punter who wants to enhance the probability of winning. The program produces betting recommendations from data readily available in the sporting press. The HX-20's portability also means you can take it to the race course and make on the spot predictions for just £24.50 plus VAT.

COMPUTAX has been designed for financial and life assurance consultants to allow them quickly to compare clients' personal income tax liabilities and how to reduce them. An impressive tool for use in the office or in the client's home, and priced just £49.50 plus VAT.

WDPRO meets dream MAIL

It's the match of the century: WDPRO and MAILPRO. Yes, our top section Sharp wordprocessor now has a mail package to keep her company.

For £69.50, MAILPRO allows you to fill a CP/M disc with names and addresses and merge them with great ease into standard letters. It's used for mail shots and for generating mailing labels.

DIY Teach Typing Course

Using the Sharp MZ80A with its professional key board, you can teach yourself or key typing without tangling any keys or typing on rollers.

The software for this is called Mimetype (priced £34.50 plus VAT), which places emphasis on rhythm and accuracy using the sound ability of the MZ80A to inform the student of good and bad progress.

MZ80B Statistics

Kuma is able to offer statistics packages for professional applications running on the Sharp

MZ80B under CP/M. The first package costs £95.00 plus VAT and covers such areas as calculation of descriptive statistics, t-tests, correlation and regression. There are facilities for data transformations, plotting scatter diagrams and collecting histogram data.

NewBrain Wordprocessor

At last a program has been developed to exploit the excellent touch typing keyboard of the NewBrain.

Called Tiny Word, it is the best NewBrain wordprocessor available and offers screen editing including insert and delete; screen or single line display, 16 editing commands; right justification; page numbering; margin and width control; etc. It runs on cassette used models A and AD and costs £24.50 plus VAT.

More about this and our machine use monitor and disassembler for NewBrain in our April NewBrain catalogue which is available free from Kuma on 0628 71778.

Kuma goes heavy on EM

Kuma is now heavily into electronic mail and we are fully supporting it across the full range of our hardware, e.g. Epson, Sharp, Osborne, NewBrain and Sirius. We also have a stock of acoustic couplers. If you want advice on how to get started on EM, just call us on 0628 71778. Incidentally we are in the BL Comet Service, so if you want to leave a message for us just dial into the Kuma box.

Putting Spectrum on the Map

An educational program written for the Sharp range is now available on the 48 K Sinclair Spectrum for only £11.95 inc. VAT.

It teaches students the geography of the UK and Ireland in an entertaining series of games and tests. It is very easy to use and extremely fast in operation due to the extensive use of machine code.

High Speed Sharp

The processing speed of MZ80A and K microprocessors can be doubled from 2MHz to 4 MHz with Kuma's new range of add-on boards.

The boards replace the standard Z80 microprocessor with the newer and more powerful Z80A, and are particularly useful for disc-based systems, especially with sample tasks like formatting discs which seem to take an eternity when you are anxious to get on. Minimal practical skill is needed to fit the boards which cost £69.50 plus VAT each.

P.S. and next month back into colour so as to alternate News with Gloss.

Kuma Computers Limited

11 York Road, Maidenhead, Berks. SL6 1PQ.
Tel: (0628) 717778 Telex: 849462 TELFAC KUM



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Osborne - 1: You can take it anywhere. CP/M + 64K RAM, Dual discs interfaces and Wordstar, Super Calc, Mbasic. All for £1250.00 + VAT. Ask us about additional software.



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PLEASE SEND ME MORE DETAILS ON: Software ☐ Hardware ☐

Sharp ☐ Osborne ☐ Name ☐

Newbrain ☐ Sirius-1 ☐ Address ☐

PROGRAMS

```

195 PLAY3,1,4,SP*20+200
200 PLOT X,Y,36:H=(H+1)AND255:X(H)=X:Y(H)=Y
210 RETURN
300 REM EACH FRAME
310 FOR N#1 TO FR
320 :PX=INT(RND(1)*30+4):PY=INT(RND(1)*20+3)
330 :IFSCRN(PX,PY)=36THENPLOTX,PY,162ELSEPLOTX,PY,33
340 :FOR M#1 TO 10
345 : IF SP THEN FOR DE=-SPTO SP:NEXT
346 : REM faster than using a WAIT
350 : GOSUB100
360 :NEXT
365 :PLOT1,N/FR*26," " 'timeline
370 NEXT
380 RETURN
1000 CLS
1002 DIMX(255),Y(255)
1003 FORD=0TO3:READX(D),DY(D):NEXT
1004 DATA-1,0,1,0,0,1,0,-1
1010 FOR D=0TO3:
1020 READ DA:POKE46080+D+8:ASC("!",)DA
1030 NEXT
1035 REM initialise screen to double height mode
1040 DATA12,30,14,7,14,30,12
1050 DATA21,30,51,18,19,50,31,42
1060 DATA0,0,8,13,13,31,63,63
1070 DATA12,30,63,63,63,30,18,33
1072 FOR I#0 TO 9:HI(I)=-1:
1080 REM NOW THE PLAYING LOOP
1085 POKE £26A,10 'SET KEYBOARD TOGGLE
1090 GOSUB 8000 'INSTRUCTIONS
1100 F#1:I#1:5 'Frame and life counts
1102 FOR RR#1 TO 1:REM TO CLEAR OUT ALL NESTED FOR..NEXT LOOPS LATE
R
1105 POKE £26A,10
1110 REPEAT
1111 :PAPER(F-1)AND7:INKFAND7
1115 :PLAY0,0,0,0
1119 :PRINTCHR$(4):
1120 :CLS:PRINT:PRINT:PRINT:PRINT
1130 :PRINTTAB(22):CHR$(27):'JBUG-EATER FRAME "CHR$(27)"N"IF
1140 :PRINTCHR$(4):
1150 IFI=1THENM="6531653165678531853185318789*631"ELSEM="738495*6
12345900"
1151 GOSUB 4000
1152 SOUND1,2000,0:SOUND4,1,0 :SOUND2,2200,0:SOUND3,80,0 'munching
sound
1160 :GOSUB 2000 'draw borders and rocks
1170 X=10:Y=10:T=0:H=1:PLOTX,Y,"s"
1171 :K#KEYS:REM clear buffer
1173 :PLOT 1,0,"BD"
1175 :REPEAT:K#KEYS:UNTIL K#<0:""
1176 :IF ASC(K#)<B OR ASC(K#)>11 THEN 1175 'is it a cursor keyPRINT
1177 :PLOT 1,0," "PLOTX,Y," "
1178 :K#ASC(K#):DX=DX(KAND3):DY=DY(KAND3)
1180 :FR=40+K#10 'time for this frame
1190 :SP=-F:IFSP>OTHERSP=-1 'speed
1191 REM set up score window black on white
1192 :PLOT32,0,PLOT33,0,23
1200 :GOSUB300 'run this frame
1210 :F#F+1 'next frame number
1220 UNTIL FALSE
1230 END
2000 REM DRAW BORDER
2001 CLS
2020 FOR Y=2 TO 25:PLOT2,Y,163:PLOT38,Y,163:NEXT
2030 FOR X=2 TO 38:PLOTX,2,163:PLOTX,26,163:NEXT
2200 FORR=10TO10*F
2210 X=INT(RND(1)*30+4):Y=INT(RND(1)*20+3)
2220 PLOT X,Y,163
2230 NEXT
2999 RETURN
4000 REM PLAY A TUNE-IN TS
4010 FOR L=1 TO LEN(TS)
4020 :NO=ASC(MID$(TS,L,1))-47
4030 :MUSIC 1,3,NO,0:MUSIC2,4,NO,0
4040 :PLAY0,0,1,1600
4050 WAIT 16
4060 NEXT
4065 WAIT 100:PLAY0,0,0,0
4070 RETURN

```



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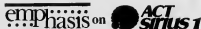
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PROGRAMS

```

8000 REM INSTRUCTIONS
8005 K$=KEY$
8010 LI=9999:SC=0
8020 CLS:INK=0:PAPER1
8030 PLOT 1,1,10:PLOT1,2,10
8032 SOUND1,2000,0:SOUND4,1,0 :SOUND2,2200,0:SOUND3,80,0
8040 PLOT 10,1,"Bug-Eater"
8050 PLOT 10,2,"Bug-Eater"
8055 PRINT:PRINT:PRINT:PRINT
8056 PLOT 2,22," HIT ANY KEY TO START"
8057 PLOT 1,22,12
8060 PRINT" Control the millipede"
8062 PRINT" using then arrow keys on"
8064 PRINT" the keyboard to change"
8065 PRINT" direction.
8068 PRINT
8069 IF KEY$<>" THEN 9999
8070 PRINT" Score 10 points for"
8072 PRINT" eating a '!',like this"
8080 PLOT 32,4,"!"
8082 X=32:Y=15:K=11:T=0:H=1
8083 FOR I=13 TO 7 STEP-2.5 :PLOTX,I,"":NEXT
8084 FOR I=1 TO 12:GOSUB 130:WAIT 10:NEXT
8085 IF KEY$<" THEN 9999
8086 K=9:GOSUB 130:WAIT 10:GOSUB130
8088 PLOT 34,18,"!":K=10
8089 FORD= 7 TO 17 STEP3:PLOT34,D,"":NEXT
8090 FOR I=1 TO 18:GOSUB130:WAIT 10:NEXT
8095 IF KEY$<" THEN 9999
8100 K=8:GOSUB130:WAIT 10:GOSUB130:WAIT10
8110 PRINT:PRINT:PRINT" For bonus points eat the"
8112 PRINT" parasitic segments"
8113 WAIT 70
8114 K=11:GOSUB 130:WAIT10:GOSUB130:WAIT10
8116 K=9:PLOT 34,19,162
8118 FOR I=1 TO 4:GOSUB 130:WAIT10:NEXT
8120 K=11:PLOT 36,9,163
8130 PRINT:PRINT" Avoid rocks or your"
8132 PRINT" own trail...."
8140 FOR I=19 TO 11 STEP -1:GOSUB 130:WAIT 10:NEXT
8150 WAIT 10:EXPLODE
8152 PRINT:PRINT" You have a limited time on each frame,watch
the time line."
8180 WAIT 300:GOSUB 14000
8190 WAIT 300
9000 IF KEY$="" THEN 8000
9999 RETURN
10000 EXPLODE
10010 FOR EX=F TO 15+F:PAPEREX AND 7:WAIT 3:NEXT
10017 SOUND1,2000,0:SOUND4,1,0 :SOUND2,2200,0:SOUND3,80,0
10020 LI=LI-1
10030 IF LI<1 THEN 11000
10035 TT=T
10040 REPEAT :REM erase bug-eater
10050 :TT=(TT+1)AND255
10055 :PLOT X(TT),Y(TT)," "
10060 :X(TT)=10+Y(TT)*10
10070 UNTIL TT=H
10090 X=10:Y=10:PLOTX,Y,"s"
10100 GETD$:DX=DX(ASC(D$)AND3):DY=DY(ASC(D$)AND3) 'wait for a key p
:REM
10110 RETURN
11000 REM DEAD
11002 POP:POP:POP:PULL :REM clear down stack
11004 NEXT RR:REM CLEAR DOWN ALL FOR LOOPS
11010 Z$=KEY$:REM CLEAR DOWN KBD
11020 IF SC=H(9) THEN 11170
11030 CLS:PAPER4
11040 FOR Y=0 TO 26:PLOT 0,Y,10:NEXT
11050 PRINTCHR$(4):
11060 PRINT" Well done "
11070 PRINT:PRINT" Please enter your name"
11075 PRINT:PRINT:PRINT
11076 L=0:N$="" :K$=KEY$:I$=""
11078 PRINT" -->"
11080 REPEAT
11085 : N$=N$+I$
11087 :PRINT:I$
11090 : GET I$
11100 UNTIL ASC(I$)<32
11110 PRINTCHR$(4):

```

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Using this program can quite literally turn the ZX Printer to your advantage. It allows the printing of large characters to any line length (within reason) by turning a copy of the character set sideways, thus permitting them to be used this way on the printer. At the same time as producing them on the printer, the computer will also print the messages on the screen, making for quite an interesting display.

These characters are printed eight times normal size using either the black graphic square (not the inverse space), smaller versions of the same character or any character specified by the user, including user-defined ones. 4-line messages may be printed at most (because of the width of the

Characters may be moved closer together by changing the value of the FOR...NEXT loop in line 410 from seven to six and the number of characters per line may be changed by altering the value of PS in line 100.

Instructions are included within the program which will run on any ZX Spectrum. If anyone simply feels like rotating their character set, the disassembled machine code is also included. This will need an assembler which produces Zilog mnemonics to run. The same effect can be produced by missing out line 620 of the program. Incidentally, it is safer and often less time-consuming if this program is saved before it is run, as it uses machine code. One mistake in the DATA statements will cause the system to crash irretrievably, in which case the program will be lost.

```

8,26,119,35,19,16,250,225,229,6
65 DATA 8,197,229,6,8,175,203,6,31
35,16,250,221,119,0,221,35,225
70 DATA 193,16,236,225,193,16,218,
201
75 RANDOMIZE USR code
80 REM the machine code sets up
a character set of 'sideways'
85 REM letters stored from address
code + 100.
90 REM *****
95 BORDER 1: PAPER 5: INK 0: CLS
100 DIM c$(4): DIM p$(4,100): DIM

```

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```

414)
105 REM if you want to print more
    than 100 chars per line, you
    can increase size of ps
110 PRINT "ps printing sideways
    on the ZX printer, this program
    can produce"
115 PRINT "4 lines of large characters
    with up to 100 characters per
    line."
120 PRINT "Any character with code
    32 to 127 can be printed -ie,
    anything"
130 PRINT "except user defined graphics."
140 PRINT "You can include spaces
    at the start of a line to improve
    the"
145 PRINT "layout as required."
150 PRINT "The large characters can
    be made up from 1"
155 PRINT "Normal sized versions
    of the same character."
160 PRINT "2)Black squares, or"
165 PRINT "3)A character of your
    choice."
170 PRINT "Choose 1,2 or 3 "INPUT
    option
175 IF option=1 OR option=3 THEN
    GO TO 160
180 IF option=2 THEN GO TO 190
185 PRINT "What character?" INPUT
    ch
190 IF LEN ch > 1 THEN GO TO 175
195 PRINT ch
200 LET max=c
210 FOR i=1 TO 4
220 INPUT "Line "i"?" i$
230 IF LEN a$=max THEN LET max=LEN a$
240 LET ps$(i)=a$
250 PRINT a$
260 NEXT i
270 LET b2=INT (cset/256)-1
280 LET b1=cset-256*(b2+1)
290 POKE 23606,b1: POKE 23607,b2
300 REM put address of new char set
    into system variable CHARS.
310 FOR j=1 TO 4
320 IF option=2 THEN LET o$(j)=
330 IF option=3 THEN LET o$(j)=c$
340 NEXT j
350 REM start to do printing
360 FOR n=1 TO max
370 FOR j=1 TO 4
380 LET a$(j)=cset+B*(CODE ps$(j)-1)-32)
390 IF option=1 THEN LET o$(j)=ps$(j),1)
400 NEXT j
410 FOR j=0 TO 7
420 FOR i=1 TO 4
430 LET w=PEEK (a$(i)+j)
440 IF w=0 THEN GO TO 540
450 LET t$=w*16-1)
460 LET c=128
470 IF w<16 THEN GO TO 510
480 PRINT TAB t$(k);
490 LPRINT TAB t$(k);
500 LET w=w-c
510 LET t$=t$+1
520 LET c=c/2
530 IF w=0 THEN GO TO 470
540 NEXT i
550 PRINT : LPRINT
560 FOR j=1 TO 4
580 LET ps$(j)=ps$(j),2 TO )
590 NEXT j
595 NEXT j
600 POKE 23692,255: REM prevent
    'SCROLL' message appearing.
610 NEXT n
620 POKE 23606,0: POKE 23607,60
630 REM restore normal char set
640 STOP
    
```

Disassembled machine code.

```

LD HL,(23730)
LD DE,91
ADD HL,DE
PUSH HL
LD BC,10
ADD HL,BC
PUSH HL
POP IX
POP HL
LD B,96
LD DE,(23606)
INC D
ROTAT PUSH BC
PUSH HL
LD B,8
RT1 LD A,(DE)
LD HL,A
INC HL
INC DE
DNZ RT1
POP HL
PUSH HL
LD B,8
JNB A
RT3 RLC (HL)
RRA
INC HL
DZRT RT3
LD (IX+0),A
LD IX
POP HL
POP BC
DZRT RT3
POP HL
POP BC
DZRT ROTAT
RET
END
    
```

MZ-80K Mole Man

by Craig Shorland

One of the recent fads in arcade games has been for little men/animals digging though the earth shooting/avoiding monsters as they go and generally doing whatever it is that little men do to amass points in these matters.

Mole Man is one of these and I had quite a lot of fun playing it, too. The big disadvantage, though, is the 80K's silly keyboard. It

was definitely not designed with action games in mind (or touch typing, either).

The aim of the game is to shoot the black monsters (after you've dug through to them) and avoid the white monster which will shoot you if it gets half a chance. This bit is quite lethal, as you can't move when the white monster is firing and if you're in the line of fire that's hard luck. You have three

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PROGRAMS

lives and two difficulty levels. In the harder one the white monster can fire through earth/rocks/other monsters to get you.

Instructions are included in the program and it's thoroughly idiot-proof, accepting

no invalid input at all. As the MZ-80K is not a high-resolution machine, the overall impression is good. It is easy and friendly to use.

^ CURSOR UP
C CURSOR DOWN
< CURSOR LEFT
> CURSOR RIGHT

```

1 PRINT"DO YOU REQUIRE INSTRUCTIONS?"
2 FORI=1TO200:NEXT I
3 GETR:IFR#""THEN$
4 IFR#""THEN$1
5 IFR#""THEN$
6 GOTO3
7 POKE9955,0
8 PRINT"MOLE MAN, <----->
9 PRINT" This game starts by asking the skill
10 PRINT" level you require. After choosing,
11 PRINT" a cross-section of underground is
12 PRINT" displayed showing soil and rocks.
13 PRINT" Tunnels will then be placed and so will
14 PRINT" five black monsters. Your task is to
15 PRINT" kill as many of these as you can before
16 PRINT" 'CHALKY' (white monster) shoots you.
17 PRINT" On level 2, 'chally' is able to fire
18 PRINT" through the soil and rocks.
19 PRINT" SO BEWARE!!
20 PRINT" PRESS ANY KEY TO CONTINUE:POKE9955,1
21 FORI=1TO300:NEXT I
22 GETR:IFR#""THEN$2
23 PRINT"----->KEYS <----->
24 PRINT"----->MOVEMENT <----->
25 PRINT"----->WALL <----->CHALKY <----->
26 PRINT"----->
27 PRINT"----->PRESS ANY KEY WHEN READY
28 PRINT"----->
29 PRINT"----->
30 GETR:IFR#""THEN$3
31 PRINT"MOLE MAN, <----->
32 PRINT" DO YOU WANT AN EASY OR A DIFFICULT GAME?
33 PRINT"-----> 1 = EASY 2 = DIFFICULT
34 FORI=1TO200:NEXT I
35 GETH
36 IFR#""THEN$5
37 TEND=INT(RND(1)/10)+53289:U=2021:R=0:M=0:L1=3:SC=0
38 PRINT"----->
39 FORI=1TO300:NEXT I:PRINT"----->
40 PRINT"----->
41 PRINT"----->
42 E=53248
43 FORI=1TO5:PRINT"----->
44 FORI=1TO6:PRINT"----->
45 FORI=1TO4:PRINT"----->
46 FORI=1TO5:PRINT"----->
47 PRINT"----->
48 PRINT"----->
49 PRINT"----->
50 PRINT"----->
51 PRINT"----->
52 FORI=1TO200:NEXT I
53 L=INT(RND(1)/10)+53289
54 IFR#""THEN$5
55 IFR#""THEN$5
56 IFR#""THEN$5
57 POKEE=L+1,BNEXT
58 PRINT"----->
59 PRINT"----->
60 PRINT"----->
61 PRINT"----->
62 PRINT"----->
63 PRINT"----->
64 PRINT"----->
65 PRINT"----->
66 PRINT"----->
67 PRINT"----->
68 PRINT"----->
69 I=53289
70 POKEI,202
71 GOTO146
72 I=X-40:IF (PEEK(X)=112) THENX=X-40:IF (PEEK(X)=40)=112) THENBOTO78
73 IF (PEEK(X)=67) THENX=X-40:IF (PEEK(X)=40)=67) THENBOTO78
74 IFPEEK(X)=40) THENN7
75 IFPEEK(X)=40) THENN106
76 IFPEEK(X)=40) THENN106
77 POKEI=40,0
78 POKEI,202
79 GOTO146

```

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- 80 X=X+40:IF (PEEK (X)=54) THENX=X-40:IF (PEEK (X+40)=54) THENGOTO7
- 81 IF (PEEK (X)=67) THENX=X-40:IF (PEEK (X+40)=67) THENGOTO7
- 82 IFPEEK (X-40)=0THENB6
- 83 IFPEEK (X)<0THENI09
- 84 IF (PEEK (X)=67) THENX=X-40
- 85 IFPEEK (X-40)=67THENX=X+40
- 86 POKE X-40,0
- 87 POKE X,202
- 88 GOTO166
- 89 X=X-1:IF (PEEK (X)=63) THENX=X+1:IF (PEEK (X-1)=63) THENGOTO95
- 90 IF (PEEK (X)=67) THENX=X+1:IF (PEEK (X-1)=67) THENGOTO95
- 91 IFPEEK (X+1)=0THENV4
- 92 IFPEEK (X)<0THENI12
- 93 IFPEEK (X)=67THENX=X+1
- 94 POKE X+1,0
- 95 POKE X,202
- 96 GOTO166
- 97 X=X+1:IF (PEEK (X)=55) THENX=X-1:IF (PEEK (X+1)=55) THENGOTO103
- 98 IF (PEEK (X)=67) THENX=X-1:IF (PEEK (X+1)=67) THENGOTO103
- 99 IFPEEK (X-1)=0THENI02
- 100 IFPEEK (X)<0THENI15
- 101 IFPEEK (X)=67THENX=X-1
- 102 POKE X-1,0
- 103 POKE X,202
- 104 GOTO166
- 105 FORTH=1:GOTO0:NEXTTH
- 106 FORF=1:TO4:POKE X,67:POKE X,208:POKE X,67:POKE X,80:POKE X,80
- 107 POKE4514,3:USR (68):USR (71)
- 108 NEXTF:GOTO77
- 109 FORF=1:TO4:POKE X,67:POKE X,208:POKE X,67:POKE X,88:POKE X,88
- 110 POKE4514,3:USR (68):USR (71)
- 111 NEXTF:GOTO86
- 112 FORF=1:TO4:POKE X,67:POKE X,208:POKE X,67:POKE X,69:POKE X,69
- 113 POKE4514,3:USR (68):USR (71)
- 114 NEXTF:GOTO94
- 115 FORF=1:TO4:POKE X,67:POKE X,208:POKE X,67:POKE X,90:POKE X,90
- 116 POKE4514,3:USR (68):USR (71)
- 117 NEXTF:GOTO102
- 118 DV=1:FORM=X-40:TOX-1:GOSTEP-40:IFPEEK (M)=207THENI88
- 119 IFPEEK (M)<0THENI38
- 120 POKE M,238:FORM=1:TO30:POKE M:NEXTM
- 121 FORM=X-1:TO20:TOX-40:POKE M,0:NEXTM
- 122 GOTO166
- 123 DV=1:FORM=X-40:TOX-1:GOSTEP-40:IFPEEK (M)=207THENI88
- 124 IFPEEK (M)<0THENI40
- 125 POKE M,238:FORM=1:TO30:POKE M:NEXTM
- 126 FORM=X-1:TO20:TOX-40:POKE M,0:NEXTM
- 127 GOTO166
- 128 DV=1:FORM=X-1:TOX-38:STEP-1:IFPEEK (M)=207THENI88
- 129 IFPEEK (M)<0THENI42
- 130 POKE M,227:FORM=1:TO30:POKE M:NEXTM
- 131 FORM=X-3:TOX-1:POKE M,0:NEXTM
- 132 GOTO166
- 133 DV=1:FORM=X-1:TOX-3:IFPEEK (M)=207THENI88
- 134 IFPEEK (M)<0THENI45
- 135 POKE M,227:FORM=1:TO30:POKE M:NEXTM
- 136 FORM=X-1:TOX-1:STEP-1:POKE M,0:NEXTM
- 137 GOTO166
- 138 FORF=X-40:TOX-40:STEP-40:POKE F,0:NEXTF:POKE X,202
- 139 GOTO166
- 140 FORF=X-40:TOX-40:STEP-40:POKE F,0:NEXTF:POKE X,202
- 141 GOTO166
- 142 FORF=X-1:TOX-1:POKE F,0:NEXTF:POKE X,202
- 143 GOTO166
- 144 FORF=X-1:TOX-1:STEP-1:POKE F,0:NEXTF:POKE X,202
- 145 GOTO166
- 146 FORF=X-1:TOX-1:STEP-1:POKE F,0:NEXTF:POKE X,202
- 147 POKE10407,0
- 148 POKE X,U
- 149 POKE U,206
- 150 GOTO152
- 151 GOTO219
- 152 IFN=4THENI57
- 153 AN=INT (RND (1)*700+53367)
- 154 IFPEEK (A)<0THENI53
- 155 A(N)=A:POKEA,207:V(N)=1:N=N+1
- 156 FORA=1:TO30:POKEA,515:A:POKEA,514,A:USR (68):NEXT:USR (71)
- 157 GETA:POKE10407,0
- 158 IFAN="M"THEN72
- 159 IFAN="T"THENI18
- 160 IFAN="X"THENB0
- 161 IFAN="B"THENI23
- 162 IFAN="A"THENB9
- 163 IFAN="F"THENI28
- 164 IFAN="D"THEN97
- 165 IFAN="H"THENI33
- 166 POKE X,202
- 167 IF (RND(0)+(RND(3)+(RND(6)) THENI77
- 168 IFV(N)=0THENI86
- 169 POKEA(NH),0
- 170 JA=INT ((A(NH)-53248)/40):IA=A(NH)-53248-JA+40
- 171 JB=INT ((X-53248)/40):IX=X-53248-JB+40
- 172 IF (IA<1X):POKEA(NH)=1:0:THENA(NH)=A(NH)+1
- 173 IF (IA<1X):POKEA(NH)=1:0:THENA(NH)=A(NH)+1

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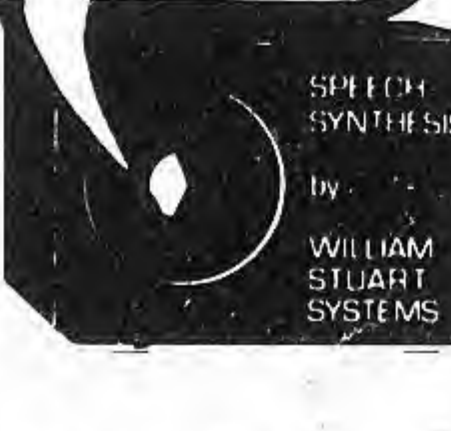
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PROGRAMS

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```
>L.
10MODE2
20F=0
30C=7:CC=7
40X=600:Y=500
50PLOT70,X,Y
60N=0
70DIMA(20)
80DIMB(20)
90PROCPAL
100IF INKEY(-58)=-1 INCX=0:INCY=4:PROCMV
110IF INKEY(-42)=-1 INCX=0:INCY=-4:PROCMV
120IF INKEY(-26)=-1 INCX=-4:INCY=0:PROCMV
130IF INKEY(-122)=-1 INCX=4:INCY=0:PROCMV
140IF INKEY(-106)=-1 PROCCOL
150IF INKEY(-99)=-1 PROCDEL:PROCMK
160IF INKEY(-74)=-1 PROCDEL:PROCPAINT
170IF INKEY(-1)=-1 F=0:PLOT70,X,Y:X=10:Y=20:PLOT70,X,Y
180IF INKEY(-90)=-1 CLG:N=0:PROCPAL:PLOT70,X,Y:F=0:GCOLOR,CC
190GOTO100
200DEF PROCMV
210IF F=1 GOTO 230
220PLOT70,X,Y
230X=X+INCX:Y=Y+INCY
240PLOT70,X,Y
250IF F=1 F=0
260ENDPROC
270DEF PROCMK
280IF N>19 SOUND1,-10,100,2:PROCPAINT:ENDPROC
290N=N+1
300A(N)=X:B(N)=Y
310F=1
320ENDPROC
330DEF PROCPAINT
340IF N=0 OR N=1 SOUND1,-10,100,2:ENDPROC
350IF N=2 MOVE A(N),B(N):DRAW A(N-1),B(N-1):N=0:ENDPROC
360Z=N
370N=N-1
380REPEAT
390MOVE A(Z),B(Z)
400MOVE A(N),B(N)
410N=N-1
420PLOT85,A(N),B(N)
430UNTIL N=1
440N=0
450ENDPROC
460DEF PROCDEL
470TIME=0:REPEAT:UNTIL TIME=20
```

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PROGRAMS

```

230 IF N=NR THEN120
240 X=INT(X+TA+0.5):Y=INT(Y+TB+0.5)
250 IF X<2 THENX=X+1:GOTO120
260 IF X>77 THENX=X-1:GOTO120
270 IF Y<2 THENY=Y+1:GOTO120
280 IF Y>39 THENY=Y-1:GOTO120
290 IF ST=0 THEN SET X,Y
300 IF ST=1 THEN RESET X,Y
310 N=N+1:GOTO230
320 END
330 REM *** Draw border ***
340 POKE 59555,0
350 UR=53247:FORI=1TO39:POKE UR+I,67:NEXT
360 UR=UR+39:FORI=1TO820 STEP40:POKE UR+I,67:NEXT
370 UR=UR+761:FOR I=39TO1 STEP-1:POKE UR+I,67:NEXT
380 UR=UR+165:FOR I=820TO0 STEP-40:POKE UR+I,67:NEXT
390 POKE 59555,1:RETURN
400 REM *** Set/Draw ? ***
410 GOSUB510: INPUT "Instructions ";IN$
420 IF IN$="N" THENST=0:GOTO100
430 IF IN$="H" THENST=0:GOTO860
440 IF IN$="PU" THENST=1:POKE54048,74:GOSUB510:GOTO120
450 IF IN$="PD" THENST=0:POKE54048,67:GOSUB510:GOTO120
460 DR$=LEFT$(IN$,1):NR=VAL(MID$(IN$,2,2))
470 IF DR$="S" THENST=0:GOSUB540
480 IF (ST>1)+(ASC(IN$)=13) THEN410
490 RETURN
500 REM *** Rub-out ***
510 FORI=1TO120:POKE54127+I,0:NEXT
520 RETURN
530 REM *** Set X,Y ***
540 GOSUB510:GOSUB590
550 INPUT "Position X ";X:IF(X<2)+(X>77) THEN670
560 INPUT "Position Y ";Y:IF(Y<2)+(Y>39) THEN670
570 SET X,Y:NR=0:GOSUB630:RETURN
580 REM *** Label border ***
590 UR=53257:POKEUR,34:POKEUR+1,32:POKEUR+10,36:POKEUR+11,32:POKEUR+20,38
600 POKEUR+21,32:POKEUR+191,33:POKEUR+192,32:POKEUR+391,34:POKEUR+392,32
610 POKEUR+591,35:POKEUR+592,32:RETURN
620 REM *** Clear border ***
630 POKEUR,67:POKEUR+1,67:POKEUR+10,67:POKEUR+11,67:POKEUR+20,67:POKEUR+21,67
640 POKEUR+191,67:POKEUR+192,0:POKEUR+391,67:POKEUR+392,0:POKEUR+591,67
650 POKEUR+592,0:RETURN
660 REM *** Range error ***
670 PRINT "Out of range":FORI=1TO2000:NEXT:GOTO540
680 REM *** Diagonal ***
690 UD$="":LR$="":UD=0:LR=0:GOSUB510
700 PRINT "Up/Down ";
710 GET U$
720 IF U$="U" THENUD=85:PRINT"U":GOTO750
730 IF U$="D" THENUD=68:PRINT"D":GOTO750
740 GOTO710
750 PRINT "Left/Right ";
760 GET L$
770 IF L$="L" THENLR=76:PRINT"L":GOTO800
780 IF L$="R" THENLR=82:PRINT"R":GOTO800
790 GOTO760
800 IF (UD=68)*(LR=82) THENAN=45:GOTO840
810 IF (UD=68)*(LR=76) THENAN=135:GOTO840
820 IF (UD=85)*(LR=76) THENAN=225:GOTO840
830 IF (UD=85)*(LR=82) THEN AN=315
840 INPUT "Number ";NR
850 RETURN
860 PRINT "
TERRAPIN
870 PRINT "
880 PRINT "The prompt Instructions requires"
890 PRINT "one of the following replies:"
900 PRINT:PRINT "Rn, Ln, Un, Dn"
910 PRINT:PRINT "(n=no of pixels max 99)"
920 PRINT:PRINT "To start at any position other than top"
930 PRINT:left give the command <S> which allows"
940 PRINT:a new start position to be SET."
950 PRINT:PRINT "N gives new screen"
960 PRINT " / allows diagonals to be drawn"
970 PRINT " PU gives pen-up & allows erase"
980 PRINT " PD gives normal pen-down"
990 PRINT " H for HELP"
1000 PRINT:PRINT "ALL COMMANDS REQUIRE <CR> TO ENTER"
1010 PRINT:PRINT "Press any key to start"
1020 GET T$:IF T$="" THEN1020
1030 GOTO100
1040 REM *****
1050 REM ** To convert from MZ-80K **
1060 REM **
1070 REM ** Video RAM 53248-57343 **
1080 REM ** Display code A/2= 1/26 **
1090 REM ** 0/9 = 32/41 M=67 D=74 **
1100 REM ** 59555,0 Blanks screen **
1110 REM ** 59555,1 Restores video **
1120 REM *****

```

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PROGRAMS

MZ-80K Double Trouble

by J C Lea

Now here's a rarity! One of the very few Pascal programs we've received, this listing is an example of a game which could not be written in Basic and still run at a reasonable speed. At some stages in the game the computer has to calculate distances and directions for up to 20 creatures and five men before a move can be made. This can involve up to 300 separate computations and does not include the further work of

keeping a record of the positions of 25 sheep and working out the quickest route around a hurdle. The game itself is easy to learn, but needs a lot of skill to play well — one mistake and you're in trouble! Some people have found it very addictive. It takes up 43k in source code and 24k in compiled form which runs direct from the MZ-80K monitor.

```
0010 PROGRAM DOUBLETROUBLE;
0020 CONST TOP:=#D000; SYNC:=#D0A6;
0030 MONSTER:=20; SHEEP:=190; MAN:=20;
0040 PITCH:=#1A1;
0050 SOUND:=#00A4; SILENCE:=#00A7;
0060 VAR PACK:ARRAY[0..40,0..130F:INTEGER;
0070 FLOCK:ARRAY[0..40,0..130F:INTEGER;
0080 MEN:ARRAY[0..5,0..130F:INTEGER;
0090 LEVEL:A,F,H,AND,FND,MNO,D:INTEGER;
0100 POINTS,MOVES:INTEGER;
0110 KEY:CHAR;
0120 MOVE,MMOVE:BOOLEAN;
0130 FUNCTION SIGN(X:INTEGER):INTEGER;
0140 BEGIN
0150 IF X<0 THEN SIGN:=-1
0160 ELSE IF X=0 THEN SIGN:=0
0170 ELSE SIGN:=1
0180 END;
0190 FUNCTION PHAN(X:INTEGER):INTEGER;
0200 BEGIN
0210 PHAN:=TOP+MEN*X,0)+MEN*X,1340;
0220 END;
0230 FUNCTION PHON:INTEGER;
0240 BEGIN
0250 PHON:=TOP+PACK(A,0)+PACK(A,1340;
0260 END;
0270 FUNCTION PSHEEP(X:INTEGER):INTEGER;
0280 BEGIN
0290 PSHEEP:=TOP+FLOCK(X,0)+FLOCK(X,1340;
0300 END;
0310 PROCEDURE NOISE(H,L,D:INTEGER);
0320 VAR X:INTEGER;
0330 BEGIN
0340 FOR X:=1 TO D DO
0350 BEGIN
0360 POKE(PITCH,H);
0370 USER(SOUND);
0380 POKE(PITCH,L);
0390 USER(SOUND);
0400 END;
0410 USER(SILENCE);
0420 END;
0430 PROCEDURE WAIT(X:INTEGER);
0440 VAR Z:INTEGER;
0450 BEGIN
0460 FOR Z:=1 TO X DO USER(SYNC);
0470 END;
0480 PROCEDURE CURSOR(H,V:INTEGER);
0490 BEGIN
0500 POKE(#1171,H); POKE(#1172,V);
0510 END;
0520 PROCEDURE SCORE;
0530 BEGIN
0540 CURSOR(6,0);
0550 WRITE(MOVES,5);
0560 CURSOR(32,0);
0570 WRITE(POINTS,5);
0580 END;
```

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PROGRAMS

```

0590 PROCEDURE CHANGEMAN;
0600 BEGIN
0610 REPEAT
0620 M:=SUCC(M);
0630 IF M=6 THEN M:=1;
0640 UNTIL MENX,1<0;
0650 WAIT(40);
0660 END;
0670 PROCEDURE CHECKMAN;
0680 VAR X:INTEGER;
0690 BEGIN
0700 FOR X:=1 TO 5 DO
0710 BEGIN
0720 IF MENX,X,1<0 THEN
0730 BEGIN
0740 IF NOT (PEEK(IPHAN(X),CHAR)=CHR(MAN)) THEN
0750 BEGIN
0760 MENX,X,0:=0;
0770 MENX,X,1:=0;
0780 FND:=FRED(FND);
0790 POINTS:=POINTS-100;
0800 END;
0810 END;
0820 END;
0830 IF (MND=0)AND(MENM,1)=0 THEN CHANGEMAN;
0840 END;
0850 PROCEDURE CHECKSHEEP;
0860 VAR X:INTEGER;
0870 BEGIN
0880 FOR X:=1 TO 40 DO
0890 BEGIN
0900 IF FLOCK(X,1)<0 THEN
0910 BEGIN
0920 IF NOT (PEEK(IPSHEEP(X),CHAR)=CHR(SHEEP)) THEN
0930 BEGIN
0940 FLOCK(X,0)=0;
0950 FLOCK(X,1)=0;
0960 FND:=FRED(FND);
0970 END;
0980 END;
0990 END;
1000 END;
1010 PROCEDURE CHECKMONSTER;
1020 BEGIN
1030 FOR A:=1 TO 40 DO
1040 BEGIN
1050 IF PACK(A,1)<0 THEN
1060 BEGIN
1070 IF NOT (PEEK(IPMON,CHAR)=CHR(MONSTER)) THEN
1080 BEGIN
1090 PACK(A,0)=0;
1100 PACK(A,1)=0;
1110 AND:=FRED(AND);
1120 POINTS:=POINTS-10*LEVEL;
1130 END;
1140 END;
1150 END;
1160 END;
1170 PROCEDURE NULLARRAY;
1180 VAR X,Y,Z:INTEGER;
1190 BEGIN
1200 FOR Y:=0 TO 1 DO
1210 BEGIN
1220 FOR X:=1 TO 40 DO PACK(X,Y)=0;
1230 FOR X:=1 TO 35 DO FLOCK(X,Y)=0;
1240 FOR X:=1 TO 5 DO MENX,X,Y:=0;
1250 END;
1260 END;
1270 FUNCTION RAND(X,Y:INTEGER):INTEGER;
1280 VAR R:INTEGER;
1290 BEGIN
1300 REPEAT
1310 R:=RANDOM;
1320 UNTIL (R<X) AND (R<Y);
1330 RAND:=R;
1340 END;
1350 PROCEDURE RPLACE(H,V,H1,V1,CH:INTEGER;VAR H2,V2:INTEGER);
1360 BEGIN
1370 REPEAT
1380 H2:=RAND(H,H1);
1390 V2:=RAND(V,V1);
1400 UNTIL PEEK(TOP+H2+V2*40,CHAR)=CHR(0);
1410 FDE(TOP+H2+V2*40,CHR(CH));
1420 END;
1430 PROCEDURE HURDLE(P,L:INTEGER);
1440 VAR X,Y:INTEGER;
1450 BEGIN
1460 Y:=RAND(4,12-L DIV 2);
1470 FOR X:=Y TO Y+L DO FDE(TOP+X*40,167);

```

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PROGRAMS

```

1480 END;
1490 PROCEDURE FHURDLE;
1500 VAR X: INTEGER;
1510 BEGIN
1520 FOR X:=1 TO (12-LEVEL) DIV 3 DO
1530 BEGIN
1540 HURDLE(X*7, (5-(LEVEL-X) DIV 5)*2+1);
1550 END;
1560 END;
1570 PROCEDURE SETUP;
1580 VAR X, Y, Z: INTEGER;
1590 BEGIN
1600 WRITE (CHR(22));
1610 NULLARRAY;
1620 BEGIN
1630 FOR Z:=1 TO 300 DO
1640 BEGIN
1650 X:=RAND(30, 100)*10;
1660 NOISE(X, X+10, 20);
1670 END;
1680 END;
1690 FHURDLE;
1700 AND:=5;
1710 FOR X:=1 TO AND DO
1720 BEGIN
1730 RPLACE(1, 4, 5+LEVEL DIV 3, 20, MONSTER, PACK(X, 0), PACK(X, 13))
1740 END;
1750 FND:=LEVEL*2+5;
1760 FOR X:=1 TO FND DO
1770 BEGIN
1780 RPLACE(20-LEVEL*2, 4, 19+LEVEL*2, 20, SHEEP, FLOCK(X, 0), FLOCK(X, 13))
1790 END;
1800 FOR X:=1 TO LEVEL*18 DO
1810 BEGIN
1820 RPLACE(32, 4, 38, 20, 72, Y, Z)
1830 END;
1840 MND:=5;
1850 FOR X:=1 TO MND DO
1860 BEGIN
1870 RPLACE(33-LEVEL, 4, 39-LEVEL DIV 2, 20, MAN, MEN(X, 0), MEN(X, 13))
1880 END;
1890 CURSOR(0, 0);
1900 WRITE('MOVES          LEVEL', LEVEL*2, '          SCORE')
1910 END;
1920 PROCEDURE ZAPIT(P: INTEGER);
1930 VAR H, V, P1: INTEGER;
1940 BEGIN
1950 FOR H:=1 TO 1 DO
1960 BEGIN
1970 FOR V:=1 TO 1 DO
1980 BEGIN
1990 P1:=P+H*V*40;
2000 POKE(P1, CHR(107));
2010 END;
2020 END;
2030 NOISE(8000, 500, 500);
2040 FOR H:=1 TO 1 DO
2050 BEGIN
2060 FOR V:=1 TO 1 DO POKE(P+H*V*40, CHR(0));
2070 CHECK-MON; CHECK-MON; CHECK-SHEEP;
2080 END;
2090 END;
2100 PROCEDURE MOVEMAN(X, Y: INTEGER);
2110 VAR H, V, P1, P2: INTEGER;
2120 BEGIN
2130 USER(SYNC);
2140 H:=MEN(X, 0)*3;
2150 V:=MEN(X, 13)*3;
2160 P1:=PMAN(M);
2170 P2:=TOP+H*V*40;
2180 IF (H=1) AND (H<40) AND (V>2) AND (V<23) THEN
2190 BEGIN
2200 IF PEEK(P1-1, CHAR)=CHR(72) THEN
2210 BEGIN
2220 IF (X=1) AND (Y=0) THEN
2230 BEGIN
2240 IF PEEK(P2, CHAR)=CHR(0) THEN
2250 BEGIN
2260 POKE(P1, CHR(72));
2270 POKE(P2, CHR(MAN));
2280 POKE(P1-1, CHR(0));
2290 MOVE:=TRUE;
2300 END;
2310 END;
2320 ELSE IF (X=-1) AND (Y=0) THEN
2330 BEGIN
2340 IF PEEK(P1-2, CHAR)=CHR(0) THEN
2350 BEGIN
2360 POKE(P1-2, CHR(72));


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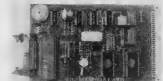
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PROGRAMS

```

2370 POKE (P2,CHR(MAN));
2380 POKE (P1,CHR(O));
2390 MOVE:=TRUE;
2400 END;
2410 END;
2420 ELSE IF (PEEK (P2,CHAR)=CHR(O)) AND (PEEK (P2-1,CHAR)=CHR(O)) THEN
2430 BEGIN
2440 POKE (P1,CHR(O));
2450 POKE (P2,CHR(MAN));
2460 POKE (P1-1,CHR(O));
2470 POKE (P2-1,CHR(72));
2480 MOVE:=TRUE;
2490 END;
2500 END;
2510 ELSE IF PEEK (P2,CHAR) = CHR(O) THEN
2520 BEGIN
2530 POKE (P1,CHR(O));
2540 POKE (P2,CHR(MAN));
2550 MOVE:=TRUE;
2560 END;
2570 END;
2580 IF MOVE=TRUE THEN
2590 BEGIN
2600 NOISE (2000,3000,200);
2610 MEN(M,0):=H; MEN(M,1):=V;
2620 END;
2630 END;
2640 PROCEDURE SHOWMAN;
2650 BEGIN
2660 USER (SYNC);
2670 POKE (PMAN(M),CHR(239));
2680 USER (SYNC);
2690 POKE (PMAN(M),CHR(MAN));
2700 END;
2710 PROCEDURE PRIMEBOMB;
2720 VAR H,V: INTEGER;
2730 BEGIN
2740 FOR H:=1 TO 1 DO
2750 BEGIN
2760 FOR V:=1 TO 1 DO
2770 BEGIN
2780 IF PEEK (PMAN(M)+H*V*40,CHAR)=CHR(72) THEN
2790 BEGIN
2800 POKE (PMAN(M)+H*V*40,CHR(71));
2810 H:=1;V:=1;
2820 NOISE (500,500,500);
2830 END;
2840 END;
2850 END;
2860 END;
2870 PROCEDURE LEAVEBOMB;
2880 BEGIN
2890 IF (PEEK (PMAN(M)-1,CHAR)=CHR(72)) AND (PEEK (PMAN(M)+1,CHAR)=CHR(O)) THEN
2900 BEGIN
2910 IF MEN(M,0)<39 THEN
2920 BEGIN
2930 POKE (PMAN(M),CHR(O));
2940 POKE (PMAN(M)+1,CHR(MAN));
2950 MEN(M,0):=MEN(M,0)+1;
2960 END;
2970 END;
2980 END;
2990 PROCEDURE BETKEY;
3000 VAR KEY:CHAR;
3010 BEGIN
3020 MOVE:=FALSE;
3030 REPEAT
3040 REPEAT
3050 SHOWMAN;
3060 KEY:=INCH;
3070 IF KEY='S' THEN CHANGEMAN;
3080 IF KEY='L' THEN LEAVEBOMB;
3090 IF KEY='P' THEN PRIMEBOMB;
3100 UNTIL KEY IN ('O','W','E','A','D','Z','X','C','I','J');
3110 CASE KEY OF
3120 'A':MOVEMAN(-1,0);
3130 'C':MOVEMAN(1,1);
3140 'D':MOVEMAN(1,0);
3150 'E':MOVEMAN(-1,1);
3160 'O':MOVEMAN(-1,-1);
3170 'W':MOVEMAN(0,-1);
3180 'X':MOVEMAN(0,1);
3190 'Z':MOVEMAN(-1,1);
3200 'I':Q:=1;
3210 END;
3220 UNTIL (MOVE=TRUE) OR (Q=1);
3230 END;
3240 PROCEDURE MOVESHEEP;
3250 VAR H,V,P: INTEGER;

```

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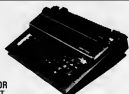
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3260 BEGIN
3270 FOR F1=1 TO 35 DO
3280 BEGIN
3290 IF FLOCK(F,1)<0 THEN
3300 BEGIN
3310 H1=FLOCK(F,0)+RAND(0,4)-2;
3320 V1=FLOCK(F,1)+RAND(0,2)-1;
3330 IF (H1>0) AND (H1<39) AND (V1>3) AND (V1<22) THEN
3340 BEGIN
3350 P1=TOP+H+V#40;
3360 IF PEEK(P,CHAR) IN (CHR(0),CHR(71)) THEN
3370 BEGIN
3380 IF PEEK(P,CHAR)=CHR(71) THEN ZAPIT(P)
3390 ELSE
3400 BEGIN
3410 POKE(P,CHR(SHEEP));
3420 POKE(P,SHEEP(P),CHR(0));
3430 NOISE(500,500,25);
3440 FLOCK(F,0)=H1;
3450 FLOCK(F,1)=V1;
3460 END;
3470 END;
3480 END;
3490 END;
3500 END;
3510 END;
3520 PROCEDURE MAKEMONSTER(X,Y,INTEGER);
3530 VAR TEST:BOOLEAN;
3540 BEGIN
3550 TEST:=FALSE;
3560 A1=0;
3570 REPEAT
3580 A1=SUC(A);
3590 IF PACK(A,1)=0 THEN
3600 BEGIN
3610 TEST:=TRUE;
3620 A2=SUC(A2);
3630 PACK(A,0)=X;
3640 PACK(A,1)=Y;
3650 POKE(PMON,CHR(MONSTER));
3660 END;
3670 UNTIL TEST=TRUE;
3680 END;
3690 PROCEDURE DINNER;
3700 VAR H,V,P,X,Y,Z:INTEGER;
3710 BEGIN
3720 A1=0;
3730 REPEAT
3740 A1=SUC(A);
3750 IF PACK(A,1)<0 THEN
3760 BEGIN
3770 P1=PMON;
3780 FOR H=-1 TO 1 DO
3790 BEGIN
3800 FOR V=-1 TO 1 DO
3810 BEGIN
3820 IF PEEK(P+H+V#40,CHAR) IN (CHR(MAN),CHR(SHEEP)) THEN
3830 BEGIN
3840 IF PEEK(P+H+V#40,CHAR)=CHR(MAN) THEN NOISE(500,1000,2000);
3850 FOR X=-1 TO 4 DO
3860 BEGIN
3870 Y1=5000;
3880 FOR Z1=1 TO 30 DO
3890 BEGIN
3900 Y1=Y1+130;
3910 NOISE(Y1+100,30);
3920 END;
3930 END;
3940 MAKEMONSTER(PACK(A,0)+H,PACK(A,1)+V);
3950 V1=1;H1=1;MOVE:=TRUE;
3960 CHECK(SHEEP);CHECK(MAN);
3970 END;
3980 END;
3990 END;
4000 END;
4010 UNTIL (A=40) OR (MOVE=TRUE);
4020 END;
4030 PROCEDURE MOVEMONSTER(X,Y,INTEGER);
4040 VAR H,V,P,INTEGER;
4050 FUNCTION TEST:BOOLEAN;
4060 BEGIN
4070 TEST:=FALSE;P1=PMON+H+V#40;
4080 IF PEEK(P,CHAR) IN (CHR(0),CHR(71)) THEN TEST:=TRUE;
4090 END;
4100 BEGIN
4110 H1=X;V1=Y;
4120 IF TEST=FALSE THEN
4130 BEGIN
4140 H1=0;

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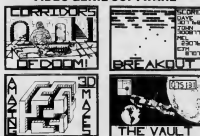
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PROGRAMS

```

4150 IF (PEEK (PHON-39,CHAR)=CHR(163)) OR (PEEK (PHON+41,CHAR)=CHR(163)) THEN
4160 BEGIN
4170 V1=SIGN(PACK(A,13-12));
4180 IF PEEK (PHON+1,CHAR) IN [CHR(0),CHR(71)] THEN
4190 BEGIN
4200 H1=1;V1=0;
4210 END;
4220 END;
4230 IF TEST=FALSE THEN
4240 BEGIN
4250 IF V=0 THEN V1=1;
4260 IF TEST=FALSE THEN
4270 BEGIN
4280 V1=0;P1=PHON;
4290 END;
4300 END;
4310 END;
4320 IF (H<0) OR (V<0) THEN
4330 BEGIN
4340 MOVE=TRUE;
4350 IF PEEK (P,CHAR)=CHR(71) THEN ZAPIT (P)
4360 ELSE
4370 BEGIN
4380 USER (SYNC);
4390 POKE (PHON,CHR(0));
4400 PACK(A,0)=PACK(A,0)+H;
4410 PACK(A,1)=PACK(A,1)+V;
4420 NOISE (8000,8000,100);
4430 POKE (PHON,CHR(MONSTER));
4440 END;
4450 END;
4460 END;
4470 PROCEDURE NEARMAN;
4480 VAR H,V,D,A1,M1:INTEGER;
4490 FUNCTION DIST:INTEGER;
4500 VAR H,V1:INTEGER;
4510 BEGIN
4520 H:=ABS(MENH,0)-PACK(A,0);
4530 V:=ABS(MENH,1)-PACK(A,1);
4540 DIST:=H;
4550 IF V>H THEN DIST:=V;
4560 END;
4570 BEGIN
4580 D:=25-LEVEL-AND DIV 2;
4590 FOR A1:=1 TO 40 DO
4600 BEGIN
4610 IF PACK(A,13)>0 THEN
4620 BEGIN
4630 FOR M1:=1 TO 5 DO
4640 BEGIN
4650 IF MENH,13>0 THEN
4660 BEGIN
4670 IF DIST<D THEN
4680 BEGIN
4690 IF (DIST<D) OR (RAND(0,10)<5) THEN
4700 BEGIN
4710 D:=DIST;A1:=A;
4720 H:=MENH,0-PACK(A,0);
4730 V:=MENH,1-PACK(A,1);
4740 END;
4750 END;
4760 END;
4770 END;
4780 END;
4790 END;
4800 IF D<25-LEVEL-AND DIV 2 THEN
4810 BEGIN
4820 A1:=A1;
4830 MOVEMONSTER (SIGN(H),SIGN(V));
4840 END;
4850 END;
4860 PROCEDURE RANDOMSTER;
4870 VAR H,V:INTEGER;
4880 BEGIN
4890 REPEAT
4900 REPEAT
4910 A1:=RAND(1,40);
4920 UNTIL PACK(A,13)>0;
4930 H:=SIGN(30-PACK(A,0));
4940 V:=0;
4950 IF (PACK(A,13)<4) OR (PACK(A,13)>21) THEN
4960 V:=SIGN(12-PACK(A,13));
4970 MOVEMONSTER (H,V);
4980 UNTIL MOVE=TRUE;
4990 END;
5000 PROCEDURE MONSTERURN;
5010 BEGIN
5020 IF AND<0 THEN
5030 BEGIN

```

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PROGRAMS

```

5040 MOVE:=FALSE;
5050 DINNER;
5060 IF NOT MOVE THEN NEARMAN;
5070 IF NOT MOVE THEN RANDMONSTER;
5080 END;
5090 END;
5100 PROCEDURE GAME;
5110 BEGIN
5120 M:=1;SETUP;MOVES:=1;
5130 REPEAT
5140 MOVES:=MOVES+1;
5150 SCORE;
5160 BETREY;
5170 MOVESHEEP;
5180 MONSTERTURN;
5190 IF RAND(0,LEVEL)>5 THEN MONSTERTURN;
5200 IF RAND(0,LEVEL)>10 THEN MONSTERTURN;
5210 UNTIL (MND=0)OR (AND=0)OR (Q=1);
5220 IF AND=0 THEN
5230 POINTS:=POINTS+FND*50+500+50*LEVEL-MOVES;
5240 END;
5250 PROCEDURE NEXTPAGE;
5260 VAR X:CHAR;
5270 BEGIN
5280 WRITELN;
5290 WRITELN('PRESS ANY KEY TO CONTINUE');
5300 REPEAT
5310 X:=INCH;
5320 UNTIL X<>CHR(0);
5330 WRITE(CHR(22));
5340 END;
5350 PROCEDURE INSTRUCT;
5360 BEGIN
5370 WRITE(CHR(22));
5380 WRITELN('DOUBLETROUBLE');
5390 WRITELN('ON A REMOTE ISLAND IN SCOTLAND AN');
5400 WRITELN('EXPERIMENT HAS GONE WRONG AND FIVE');
5410 WRITELN('MUTANT CREATURES HAVE ESCAPED');
5420 WRITELN('THESE CREATURES WERE BRED TO WITHSTAND');
5430 WRITELN('MOST FORMS OF ATTACK AND MAY ONLY BE');
5440 WRITELN('ILLED BY BLOWING THEM UP WITH A LARGE');
5450 WRITELN('QUANTITY OF HIGH EXPLOSIVE, THE ONLY');
5460 WRITELN('WAY TO DO THIS IS TO ENTICE THEM TO STEP');
5470 WRITELN('ON LAND MINES LAID BETWEEN THEM AND YOUR');
5480 WRITELN('FIVE MEN');
5490 WRITELN('THE CREATURES ARE ATTRACTED BY MOVEMENT');
5500 WRITELN('AND BY SMELL, IF ONE CATCHES A MAN IT');
5510 WRITELN('WILL EAT HIM AND THEN DIVIDE IN TWO');
5520 WRITELN('TO MAKE THINGS EVEN MORE DIFFICULT A');
5530 WRITELN('FLOCK OF SHEEP IS ALSO LOOSE AND THESE');
5540 WRITELN('TEND TO GET IN THE WAY AND GET EATEN TOO');
5550 NEXTPAGE;
5560 WRITELN('THE FOLLOWING KEYS ARE ACTIVE');WRITELN;
5570 WRITELN('Q W E MOVE NW N NE');
5580 WRITELN('A D MOVE W E');
5590 WRITELN('Z X C MOVE SW S SE');WRITELN;
5600 WRITELN('S CHANGE MAN TO MOVE');
5610 WRITELN(' (SHOWN BY FLASHING CURSOR)');
5620 WRITELN('P PRIME BOMB');
5630 WRITELN('L STEP BACK FROM UNPRIME BOMB');
5640 WRITELN('TO PICK UP BOMB APPROACH IT FROM BEHIND');WRITELN;
5650 WRITELN('QUIT');
5660 NEXTPAGE;
5670 WRITELN('CHARACTERS ARE SHOWN THUS:');WRITELN;
5680 WRITELN(CHR(99));3,' MEN ',CHR(247);3,' BOMB';
5690 WRITELN(CHR(139));3,' SHEEP ',CHR(241));3,' PRIME BOMB';
5700 WRITELN(CHR(103));3,' CREATURES';WRITELN;
5710 WRITELN('POINTS ARE GIVEN FOR KILLING CREATURES');
5720 WRITELN('SAVING SHEEP AND NOT LOSING MEN');WRITELN;
5730 WRITELN('EACH TIME YOU KILL THE CREATURES THE');
5740 WRITELN('GAME IS MADE MORE DIFFICULT BY THERE');
5750 WRITELN('BEING MORE SHEEP AND SHORTER AND LESS');
5760 WRITELN('HARDLES, THERE ARE ALSO MORE BOMB BUT');
5770 WRITELN('EVENTUALLY NOT AS MANY AS THE COMBINED');
5780 WRITELN('TOTAL OF MEN SHEEP AND CREATURES');WRITELN;
5790 WRITELN('THE CREATURES MOVE FASTER AND THE');
5800 WRITELN('POINTS GIVEN ARE HIGHER');
5810 NEXTPAGE;
5820 END;
5830 PROCEDURE NEWGAME;
5840 BEGIN
5850 WRITE(CHR(22));
5860 CURSOR(0,4);
5870 WRITELN('YOU REACHED LEVEL ',LEVEL);WRITELN;
5880 WRITELN('AND SCORED A TOTAL OF ',POINTS);WRITELN;
5890 WRITELN('DO YOU WANT ANOTHER GO?');
5900 REPEAT
5910 X:=INCH;
5920 UNTIL KEY IN ['Y','N'];

```

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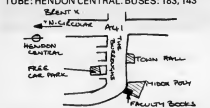
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PROGRAMS

```

● 5930 END;
5940 BESIN
5950 (R#0,C-,S-,A- #)
5960 INSTRUCT;
5970 REPEAT
5980 Q:=0;LEVEL:=0;POINTS:=0;
5990 REPEAT
6000 LEVEL:=SUCC(LEVEL);
6010 BARE;
6020 UNTIL (MND=0) OR (Q=1);
6030 NEWGAME;
6040 UNTIL KEY="N";
6050 END.
    
```

Tandy Colour Plotter Demos

by A Lovett

The Tandy CGP-115 colour plotter is a
rather slow but versatile unit which can be
driven by any suitable computer through a
Centronics interface cable. It works w/ll
with the Acorn Atom and BBC computers.
The three programs listed below were written
for the Atom. 'Pattern' prints a square
cross-stitched pattern, 'Sine & Cosine
Waves' prints a graph of sine and cosine
waves and 'Graph' draws a sales chart.
Both serve to demonstrate the abilities of
the little printer. Where the Atom uses
PRINT's owners of the BBC and other
computers should use PRINT CHR\$().
Mode switching on the plotter (from
graphics to text and back) is done by sending
ASCII codes 17 (return to text) and 18
(enter graphics) to it from the computer.

```

● Graph
● 501M48
● 10D1M48;L="CH"
● 15GOS.P
● 20GOSUB1
● 30FOR J=1 TO 12 STEP 2;
● GOSUB18;B=VAL A;GOS.T
● 40X=VAL A;Y=B
● 45GOSUBX
● 50NEXT J
● 55P.#17
● 60P.#3
● 70END
● 501REM
● 510 Q=7;B#256
● 520 DO Q=Q+1
● 530 UNTIL ?0=HD AND Q=?3=L
● 540 Q=Q+4;RETURN
● 550#
● 600# REM
● 610R=-1
● 620 DO R=R+1;A?R=Q?R
● 630 UNTIL A?R="CH", " OR A?R=#D
● 640 1FA?R=#D Q=Q+3
● 650 Q=Q+R+1;A?R=#D;RETURN
● 660#
● 1000X
● 1015IF J=1;P."M"X","Y";RETURN
    
```

When in graphics mode the Atom requires
an apostrophe after each statement, which
gives a carriage return. This is not required
on the BBC Computer. In all programs
below the plotter is operating in graphics
mode.

In graphics mode patterns, pictures and
graphs can be drawn alongside text. A new
range of commands is made available by
this mode and these are demonstrated in the
programs below. They are given using the
PRINT command and a letter in inverted
commas and include such facilities as pen
moves, print size variation and draw
commands.

No instructions are necessary for the use
of these programs - they need only be
keyed in and run.

```

● 1020P."D"X","Y"
● 1030RETURN
100010,0
1010 75,20
1020 50,50
1030 100,100
1040 30,130
1050 75,200
2000P.#2,#18
2010P."R00,-200"
2020P."1"
2030P."X0,10,10"
2040P."HX1,25,10"
2050P."52"
2060P."Q3"
2070P."M-10,10"
2080P."PSALE"
2090P."M10,-40"
2100P."Q0"
2110P."P 1982"
2115P."S1"
2200RETURN
    
```

Pattern

```

10P.#2
20P.#18
30X=100;Y=100
40P."M0,-350"
    
```

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photos of particular equipment features. (Note:
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but see, for example, 'The poor man's printer',
PCW Dec 1978 or 'Hard copy at a soft price', PCW
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PROGRAMS

```

• 50P,"I"
• 100 FOR A=0 TO 200 STEP 5
• 105GOS .q
• 110P,"M"(X+A),"100"
• 120P,"D300","(Y+A)"
• 130P,"D"(300-A),"300"
• 140P,"D"X","(300-A)"
• 150P,"D"(X+A),"100"
• 160NEXT A
• 163P,"H"
• 165P,#17,#3
• 170END
• 500A REM COLOUR CHANGE
• 510IFA/20=0 OR A/20=10 THEN P.
  "C0":RETURN
• 520IFA/20=1 OR A/20=5 THEN P.
  "C1":RETURN
• 530IFA/20=2 OR A/20=6 THEN P.
  "C2":RETURN
• 540IFA/20=3 OR A/20=7 THEN P.
  "C3":RETURN
• 550IFA/20=4 OR A/20=8 THEN P.
  "C0":RETURN
• 560RETURN

```

Sine & Cosine Waves
 IST
 • 100DIM A(2)
 • 110P.#2

```

120P,"-----SINE AND COSINE
CURVES-----"
130P.#18
140P,"R0,-150,240,0"
150P,"I"
160P,"X1,-20,10"
170P,"HX1,20,10"
180P,"HX0,10,5"
190P,"HX0,-10,5"
200P,"C0";P,"L0"
210B=30;H=15;C=0;GOS .a
220P,"C1";P,"L3"
230B=-100;H=80;C=0;GOS .a
240P,"C2";P,"L5"
250B=100;H=80;C=1;GOS .a
260P,"C3";P,"L0"
270B=100;H=80;C=0;GOS .a
280P,"C0"
290P,"A"
300END
500A REM *DRAW CURVES*
510A="M"
520 FOR I=-200 TO 200 STEP 4
530 X5=I/8*PI
540 IF C=0 THEN Y=X(SIN(X5)*H)
550 IF C=1 THEN Y=X(COS(X5)*H)
560P.#A,I,"Y";#A="D"
620NEXT I

```

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TI PROFESSIONAL

continued from page 156

be scrolled both up and down and left and right. And the software is sufficiently intelligent to remove those phrases or questions that are ruled out by prior selections so that you end up with a usable query. Once you have built a query that the system can execute it tells you so by displaying the word "Executable" at the lower right-hand side of the screen. By using the return key to move a reverse video block (rather like the option boxes in Multiplan) among various main menu selections, the query can then be processed and relevant database records selected for screen display.

TI has already demonstrated the natural language interface working with the Dow Jones online retrieval service, and has indicated that there will be database specific versions on the market in the near future. Also, it will be possible to combine the natural language facility with the voice I/O capability, so making possible

some interesting program development projects.

Visicorp's version of the Xerox Smalltalk/Apple Lisa software offerings is also to be made available on the Professional. Called VisiOn, it provides the user with the ability to create "windows" on the display screen which can be edited, moved, swapped, deleted, and generally altered in some way by means of a mouse - the in-vogue micro computer companion which moves a screen cursor as it is pushed around on a desk.

Other products on the cards are two modem boards which can run at 300 bits per second or 300/1200 bps; analog interface board; a clock board; and an 8087 co-processor.

Conclusions

The TI Professional is a well made business computer system which has been designed with a specific purpose in mind - to capture a significant portion of

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the IBM PC microcomputer market and thereby put TI in a strong position with regard to the small business computer market. The Professional has a lot of compatible features and comes out at a few hundred dollars less than the IBM machine when standard versions are compared. Furthermore, it has a number of innovative features; the kind of software and hardware products usually found on much more expensive machines.

And maybe that's where TI has got an image problem. Users generally like to work out for themselves whether or not a particular machine suits their needs. In the case of the Professional, a user might reject the machine and buy an IBM PC on the basis that it is the original and is already supported by a monument of software and hardware. There again, the Professional may be attractive because of the future products that will be released.

And we're back to the old situation of first deciding what your needs are and then buying a system to match, and not vice-versa.

I liked the machine as long as I thought about it as a new business machine from TI - I got a little worried about it when I thought of it as an IBM PC work-alike.

Software

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300 baud internal modem: Compatible UK

300/1200 modem card: prices to be advised

1-plane graphics board: £260

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Model 850 printer: from £495

RELIABLE CODE

continued from page 111

George operating system that performs the timeslice function). This routine looks to see if the 'Break' key is being pressed; if so, it suspends the program. This is extremely useful for breaking into loops. The coordinator is called by ICALL and IRTN, by the multiply and divide routines, subscript calculation and indirect fetch. Between that lot, it's quite hard to accidentally write an endless loop that the Break key won't get you out of; but, for the pathologically loop-happy (me!) I also have a set of loop-construction macros covering all the normal forms of loop which call the coordinator directly.

If you really must have recursion (for instance for Pascal programs) you can achieve it at high efficiency by putting local variables in the parameter area (with their

own length byte!) and copying the parameter area 'somewhere else' (to an auxiliary stack, which could be interleaved with the control stack) if the recursion flag becomes non-zero when you increment it. On the first entry, when the flag becomes non-zero, the area contains rubbish. Of course you have to reinstate these old values when you leave the procedure.

Note that all variables remain statically allocated. (This implies that you can't have dynamic arrays.)

Note also that the copy of any given variable in a recursive nest which is 'visible' according to the Algol and Pascal scope rules is the statically allocated copy: the stacked copies are all invisible anyway. You don't need what an Algol implementor would call a 'Display Vector' to find things. (This is not strictly true of certain pro-

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cedures which are passed out of their declaration scope as parametric procedures to other procedures: you can't implement Algol 'call by name' like this.)

Note, finally, that by the time you have the extra code to administer the auxiliary stack and the rather general version of UNWIND required to be able to cope with a jump out of a procedure, you haven't

much space for program in 16k! For my applications, recursion is too much of an overhead.

By a little planning it's possible to provide an environment on TRS-80 style machines that allows sensible detection and reporting of programming errors while maintaining high space-efficiency and reasonable speed. **END**

LEISURE LINES

by J J Clessa



Quickie

A certain family has three children — half of the children are boys. How is this?

Prize Puzzle

Four ladies went into a post office to buy stamps.

Alice bought only 3p stamps. Betty bought only 4p stamps. Celia bought only 6p stamps and Doris bought only 8p stamps.

The total money spent by the ladies was £1.61.

The daughter got the fewest number of stamps and spent 24p.

The mother got the most stamps — she spent 72p.

Which of the four women were mother and daughter?

February Prize Puzzle

A low response — only 21 entries in all — denoting a more than average degree of difficulty.

There were several possible solutions to most of the ten parts of the problem, but we are only printing the answers submitted by the winning entrant who is Mr J E Weir of Glasgow, who also, if I'm not mistaken, has won on a previous occasion. Well, there is no rule that says you can't win twice if the luck of the draw is with you.

The winning solution was:

1 000 000 007

1 111 111 121

2 222 222 291

3 333 133 333

4 444 444 447

5 555 555 557

6 666 666 661

7 777 777 777

8 888 880 881

9 999 999 999

Congratulations, Mr. Weir, your prize should be with you by the time you read this.

BLUDNERS



Last month's review of the Oric contained a couple of mistakes — one of which Steve has owned up to; the other he insists is a typographical error. In his comments on the bug in the STRS command, mention was made of the Oric returning a wrong value for LEN (AS) after AS had been loaded with a value using STRS. In fact, Microsoft Basic includes the sign value each time LEN is called — this does not, however, explain the error in VAL which will have to go down as an Oric bug. In the program line to correct this, LEN was mysteriously changed to LINE — change it back and everything should work okay.

At the end of last issue's 'A look at C', we printed a wrong name for the UK agent of The Software Toolworks. System Science is the company to contact, on 01-739 0540.

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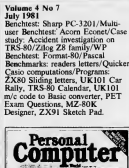
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Vol 5 No 10 October 1982
 Benchtest: HP-86, Position 9000/Database Benchtest: Personal Pearl/3D Graphics for BBC Computer/Hacking Techniques/Designing your own Database/CP/16-86 v MS/DOS/Clock Calendar Card for Apple II/Calc: Corner hints for Sharp PC122/Programs: ZX81 Star Trek, PET Knockout, PET Trains.



Vol 5 No 11 November 1982
 Benchtest: Canon CX-1; Hewlett Packard HP75/Database Benchtest: Condo/Apple II Clock Calendar Card Part - Algebra checking/Benchmarks summary/Bit Stik graphics for Apple/Calc Corner - HP41C, Casio I-702p program/PCW Show report/Tiny printing on Centronics 739/Screenplay - Acorn Atom/Programs: Apple Piano; Apple Moon Module; PET Letter-writer; UK101 Logic; Atari Walls; Sharp MZ80K Area-filing; RML 380Z Restore.



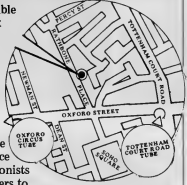
Volume 6 No 1 January 1983
 Benchtest: Jupiter Ace/Torch/Database Benchtest: Superfile/Warmer-Or programming technique/Expert systems: Tokyo Data Show report/Forth Benchmarks/Digital Video/The Nearly Man - Charles Babbage/Portable Computer World - Continued Fractions/Micro Chess/Screenplay - Spectrum/Programs: VIC Connect-4/VIC/Mon/Atari character set mover/VIC UFO/PET Forth Teacher/VIC Doppler/BBC Gomoku.



Volume 6 No 2 February 1983
 Benchtest: Sage/Database Benchtest: BusiPost/Which Spreadsheet - new series/Networks - new series/Expert systems/BBC graphics revealed/Logo Turtle/Micro Chess - Fidelity's Prestige/Portable Computer World - Sharp PC1251 Benchtested/Numbers Count/Screenplay - BBC games/Programs - UK101 Vocabulary Test/PET Race Chase II/Apple Character Plotter/Variable Checkchart/ZX81 hex calculator/Atom Background/Video Genie Aircraft Lander/Atari Flashback/MZ Text Analysis.

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Volume 6 No 3 March 1983
 Benchtest: Corvus Concept, Computers Lynn/Database Benchtest: DataPrim/Which Spreadsheet? - Prophet II/IBM 9000 Instrumentation Computer/Apple Word Handler/Networks - Part II/ZX81 Graphics Module/Sharp MZ-80A Enhancements/Micro Chess - the Conchise range/Screenplay - Atari 800/Portable Computer World hex listings for Casio f6602p and Sharp PC1211/Programs: Atari Animation/Chinese Horoscopes/PET Patience.



Vol 6 No 4 April 1983
 Benchtest: Onco-1, LSI M-Four/Database Benchtest: Rescue/Which Spreadsheet? - Multisim/Networks - Part 3/Shelton Signet/A Look at C-Interfacing the BBC/Apple Screenplay - Design 32/Pet speed compiler/Screenplay on the BBC/Dork program generator/Micros in dentistry/Generality - Coding family relations/Portable Computer World - Fax tables on Casio/Chess - Intelligent Software/Programs: BBC Bigrim/PET Billy/BBC Engine Failure/ZX81 Molecular Weight/II Adventure/Barbump/TRS-80 Word Scrambler.

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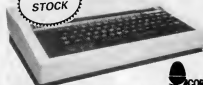
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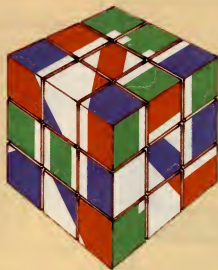
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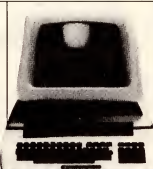
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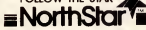
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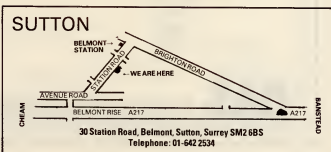
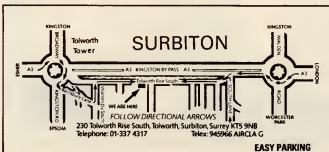
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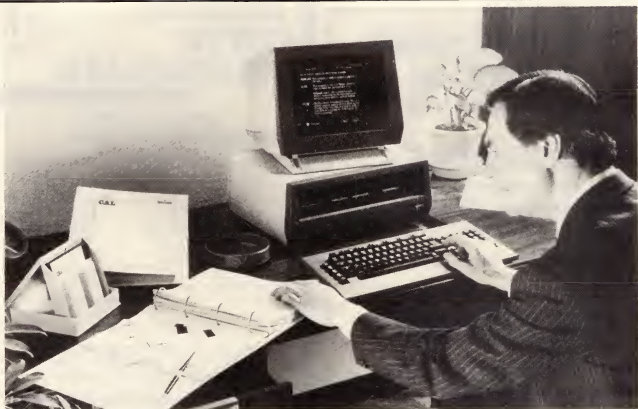
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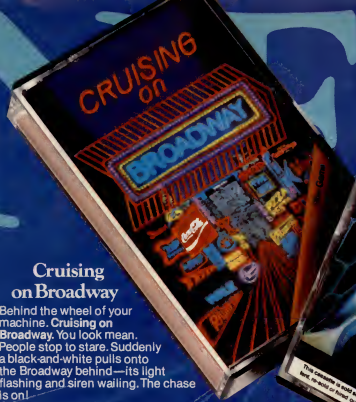
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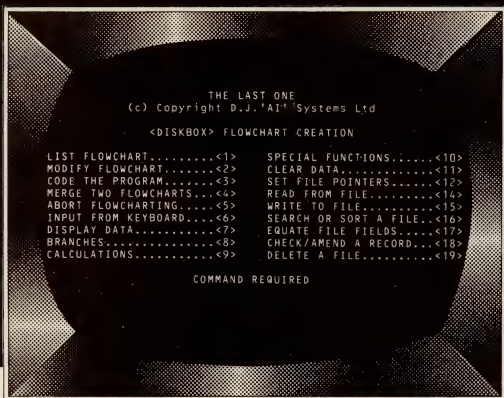
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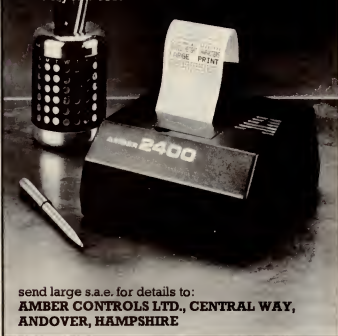


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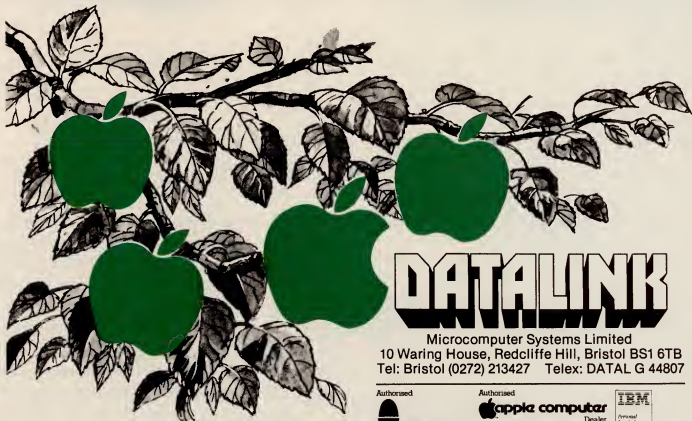
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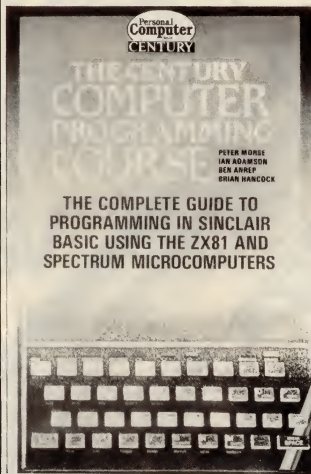
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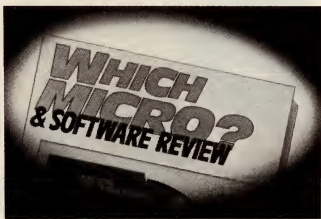


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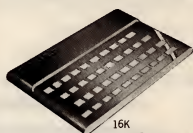
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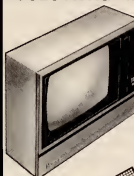
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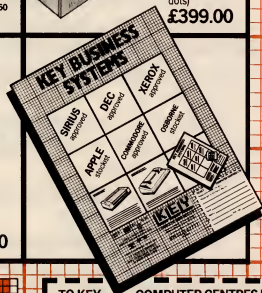


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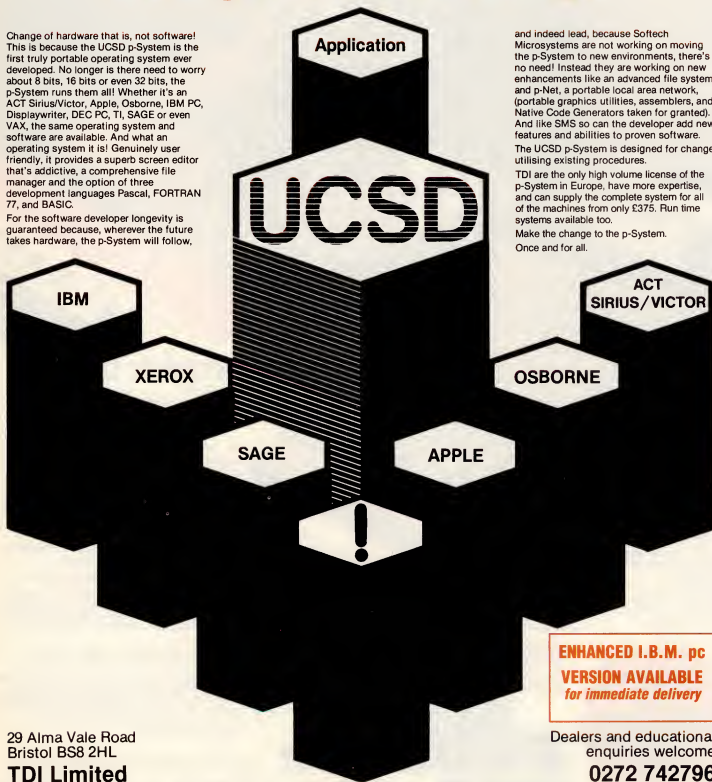
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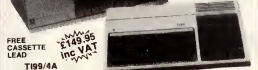
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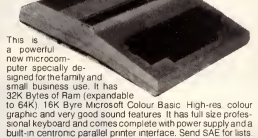


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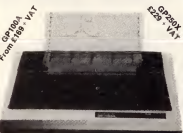
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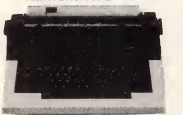
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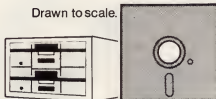
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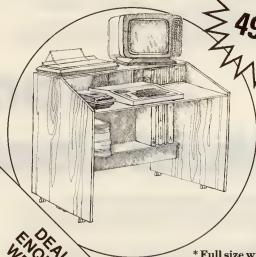
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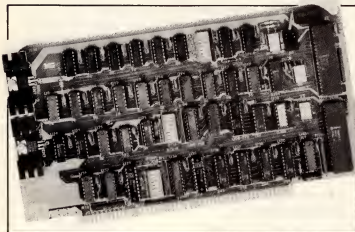
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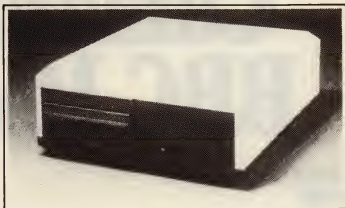
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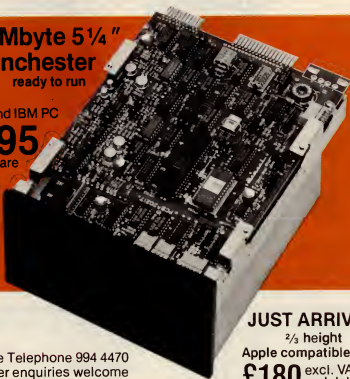
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field protection/classification
either-or same as greater/smaller
sorts 'alpha or numeric' any window

12 online file architectures
240 fields using cross-referencing
cross-record calculations
Jump-to any record in 12 files
User-definable files/field words/sizes
32000 records per filename
20 main/200 sub fields per record
field end record related formulas
Jump-to any of 32000 records per file

random binary/key/multiple field search
"if then" questioning
file protection/password entry
range match/not match integer match
sort speed 500 records per 20 seconds
endless either-or matching
formulate recall on selection criteria
13 interrogation question types
short filing output/audit trails

User-defines files/field words/sizes, "select-mail-shots", "production-process", "purchase/sales-analysis", "personnel-file"

ONE OF THOUSANDS OF DIFFERENT TASKS ON WHICH THIS PROGRAM MIGHT BE EMPLOYED

DBMS II MACROS WORK FROM THE MOMENT YOU INSERT THE 'TASK DISK' IN THE COMPUTER

Simply design your file, give its fields your words, setup your report mask, and then enter your records. Switch to 'automatic drive' and formulate any task you wish the program to fulfil, the task is stored as a macro. Take a copy of the program on another 'task disk' and from then on, the task disk will function without a single keystroke. Think of a number of such 'task disks' such as 'stock-in-order reports', 'stock-valuation reports', 'analysis', 'patient history analysis', 'research-analysis', 'budgeting', 'vehicle-location control', 'librarian analysis', 'plus more?'

Previous issues showed examples of 'employees-short-list', 'garage stock re-order', 'sales analysis', 'librarian's list', 'hospital's patient list'. Here is an example of a rental recording file and some reports it might generate.

The report may look like this:

- 1- record number (413)
- 2- client (Radio cars ltd)
- 3- date of contract (01.04.81)
- 4- date last pmt (12.02.82)
- 5- period frequency (36-monthly)
- 7- amount of pmt (£2.50)
- 8- item type (Taxi-phones)
- 9- repairs made (faulty microphone - item replaced)
- 10- cross reference (3,442 details of full system spec end supplier)

One report might be: select??

all records where the amount of payments are less than 50 pounds, that were taxi-phones and faults were detected. When found, pick up the cross reference code and look up that record to identify the supplier.

DBMS II (WITHOUT MACROS) AND DBMS III ARE FULLY IMPLEMENTED UNDER CPM-86 (tm) AND MS-DOS (tm) ie: < SIRIUS/VICTOR/IBM> DBMS II IS 395.00 (or 250.00 by mail order ex. training). DBMS III IS 575.00 (or 295.00 by mail order ex. training).

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	-GB0 V D.U	150.00
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	-COMPUSTAR 64K RAM 320K DISKS	1995.00
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All prices marked C are 8 1/8 bit macros

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	-820	1885.00
OLYMPIA	-820	1885.00
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Requires the prior acquisition of DBMS III.7

Sale ledger (95 pounds)
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re order (95 pounds)

Purchase ledger (95 pounds)
The address mailer (95 pounds)

Nominal ledger (95 pounds)
Quasort/Qnsort (500 records/
15 seconds) (95 pounds)

DBMS 111.7 new switch mode facility enables you to cross up to 12 different files (32000 records per file) pre-selecting any of up to 20 fields per record/file for display/print output (240 fields) in all. One massive enquiry can pass through 384 records.

You might have two files whose records are directly related to each other, so that the first file (say containing names and addresses) refers to the second file (say inventory) and other information relating to the same record numbers of the first file directly. Then you can simply select that in file 1 you are interested in just the name and telephone numbers, whereas in file 2, you are interested in the income, trading period and number of branches, information. Your enquiry can then pass through both files highlighting that information only, rather like the display below.

File 1 record 11 G.W. Computers 101-636-8210 1 1 1
File 2 record 11 800,000 15 years 1 1 1
File 1 record 21 Lloyds Bank 101-122-4567 1 1 1
File 2 record 21 1000,000,000,00 100 years 1 1 1
File 1 record 31 Selfridges 101-631-4818 1 1 1
File 2 record 31 100,000,000 100 years 1 1 1
File 1 record 41 Debenhams 101-636-1234 1 1 1
File 2 record 41 120,000,000,00 150 years 1 1 1

Actually there doesn't need to be a strict correlation between the same record numbers in different files, and you can also on just one JUMP command go to any record in any of the 32000 records in any of the twelve files and carry on cross-referencing from there onwards.

Do you see that? 7. Only from G.W. Computers Ltd. The database leaders.

Each module is a set of 'task disks' designed for minimal learning curve. This software derives from modules of 'DBMS III' and runs reports without your secretary having to touch a single key.

Consider the advantages in these features: The user manual is contained in FIVE pages. All reports are generated by robot functions. Reliability tested (benchmark PCW June). Works in a network multi-user environment. Fast easy data entry. Files are re-organised and sorted automatically. Produced by the same people that originated 'BUSINESS', 'DBMS II', 'DB-CALC', 'AUTOLOAD AND RECOVER', 'ETC' and sold successfully over the past five years.

Also see our advertisement next page.

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Based upon one hard disk and multiplexor module the G80/86 networks feature full network sharing of data resources by adding different stations that may be as various as Sirius/Victor 9000/IBM/PetN Star/Sanyo.

We also have a special 'spooler module' as well as software controllable port expanders and modems for output to telephones, printers, and screens so that a number of terminals may share the resources of one printer, as well as able to send files over the telephone at any time (day/night) to both store on the hard disk and print out as well.

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Contains the highest state of the art software available today.

ALL IN ONE PROGRAM THE DBMS IV is 575.00

When you budget for a complete system of software you eventually end up with a host of packages like, Sales, Purchases, Nominal, Data, Text, Calc, Mailshot, Invoice, Order, Workflow, Personnel, and so on. The list is endless and the outlay several thousands of pounds.

Features: Design a form as wide as a window of 250 characters, long as needed. Cursor movements are 'left, right, up, down, delete left, delete right, tab right-left-up-down'. Print your form as you like directly on the screen.

Text: Write a letter as you see it on the screen, edit it then simply enter P to print.

Calc: Set into the form, your data fields, 'TEXT' and specific file-related activities, formulae and validation checks. Enter values and see the spreadsheet calculate itself.

Database: Search files for data to be inserted to fields specified. All the features of DBMS II, explained elsewhere in our ad.

Here's an example of an invoice you might design for your stationery... You could design your own spreadsheet, order form, statement, or any other kind of form that is required to fit your existing stationery.

INVOICE <0>-----			
To <1>-----	From: G.W. Ltd		
<2>-----	55 Bedford Court Mans.		
<3>-----	Bedford Avenue		
<4>-----	London W.G.1.		
<5>-----	Tel. 01-636 8210		
Data <6>-----	Tax point <7>-----	Agent <8>-----	
Quantity	Description	Cost	Tax Total
<9>-----	<10>-----	<11>-----	<12>-----
<14>-----	<15>-----	<16>-----	<17>-----
and so on...			
Total... <19>-----		Tax... <20>-----	

<??> item <1> to <5> internal command to request name input, and then search an address file for details.

<??> item <6> to <7> request date input and validate.

<??> item <8> request agent number and validate range.

<??> item <9> request quantity, validate range.

<??> item <10> request description, search file, accept, and calculate fields <11>, <12>, <13>, if finished invoice then calculate fields <19> and <20>.

Now comes the more valuable facility. You can provide the FORM with file-related instructions, not only to request a 'console' input for a file search against names, and stock, but after the invoice is finished the fields you have selected may be passed to related files.

eg. Send fields <0>, <1>, <6>, <7>, <11>, <12>, <13>, <19>, <20> to sales ledger.

Then send fields <9>, <10>, <11> to product analysis file.

Then send fields <0>, <1>, <7>, <19>, <20> to V.A.T. file.

Then send fields <13>, <14>, <15>, <16>, <17>, <18> to Nominal ledger. Do you see?



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The Exterminator

Stage 1: Kill the birds, but they have guided missiles to help them.

Stage 2: Run out of the safe area, pick up the eggs and get back to the incinerator

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You may have seen Kong in the arcades, if not a giant ape has stolen your girl now you must rescue her avoiding the obstacles thrown at you

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CPM is available. What more to say except that Digital Research now give their blessing to SAGE with their CPM68K system. This comes complete with a 'C' compiler and will allow UNIX software to be compiled and run under the CPM environment.

MicroAPL offer their MIRAGE APL system on SAGE computers, and again the SAGE delivers performance only previously found on mainframe or timesharing systems. As we say it's rather hard for anyone developing software to look away from SAGE because it makes other so-called 16 bit computers look pedestrian.

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PEELINGS II magazine (Feb 1983) compares SNAPSHOT with Wild Card and Crack-Shot:
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SNAPSHOT will copy any memory-resident program that runs on the 48K Apple. SNAPSHOT uses your 16K RAM card* to interrupt a running program and dump the entire contents of 48K and registers to an unprotected backup disc. SNAPSHOT backs up programs that baffle nibble copiers like Locksmith without any complex parameter changes or trial-and-error hassle. And SNAPSHOT is still more effective, less expensive and easier to use than its imitators.

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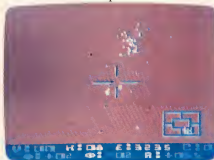
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THE BIG SQUEEZE

It was a hot summer night and the heat was on in more ways than one. I reached over and flicked on the power. The screen went green and blinked READY. Time to get busy. Just then the phone rang.

"Andrews," it barked, "have you come up with those figures yet?"

"Take it easy," I said. "I'm on the case."

"Andrews, you won't have the fingers to *grip* a bloody case if you don't deliver the goods. Nobody messes with the firm."

"OK, OK," I whined. "Just give me 'til tomorrow morning..."

There was a grunt and then just the purr of a dialling tone. My hands were sweaty and it wasn't from the sweet and sour pork I'd had for lunch. I poured a shot of bourbon and rummaged for the July issue of *Personal Computer World*. There was an article on sub-routines in the January issue which might save me several hours of number-crunching. Now where was that issue?"

Ten minutes later the first pricklings of panic ran up my spine. It had vanished. If only I'd ordered a Mark III PCW Binder to keep the copies in. Already I could imagine the roaring whine of the chain saw... maybe they'd only take a few fingers...



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Most people look to computers to perform specific tasks, whether it's the business user needing to produce a spreadsheet analysis, the archivist wishing to computerise files, or the games enthusiast looking for another Space Invaders. In every instance the solution starts not with the hardware, but with the software. Find the right software, and you've found the answer to your problems. Buy the wrong hardware, and your problems have just begun.

The logical approach to buying a computer is first to choose the program which performs the required functions and only then to decide on the hardware which will most efficiently run that program.

Clearly there is a need for a magazine which helps its readers do just that. A magazine that provides solutions, not problems. A magazine that considers the ever-increasing volume of software available and guides its readers to that which will best suit their requirements.

SOFT is that magazine.

The Publishers

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World to market leadership before selling the title to VNU last Autumn. Then we launched MicroScope. Now established as the market leader, MicroScope is required reading throughout the industry. SOFT will be only our third title in this field. But it will be the first radically new approach to consumer micro magazines since PCW began it all in 1978.

The Writers

The Managing Editor of SOFT will be Dick Pountain, currently MicroScope's Software Editor, and previously Managing Editor of Personal Computer World. SOFT's Editor will be Gareth Jefferson, MicroScope's present International Editor and a man with considerable experience in editing specialist consumer magazines. The contributors will include people of the calibre of David Tebbutt, Guy Kewney, Mike Liardet, Kathy Lang and Sue Eisenbach. With SOFT they will establish a new standard in microcomputer magazine publishing.

The Concept

SOFT is committed to reviewing more software in greater depth

than any other microcomputing magazine. It will not merely make mention of the software package and documentation, it will thoroughly analyse every program in its entirety.

SOFT will certainly not ignore hardware. But hardware will be important only in so far as it influences the improvement of software.

SOFT talks not about computers, but about what computers can do. And all those involved with microcomputing, on any level, will need to read SOFT. Every month. To get the most from their computer. To keep pace with the explosively-expanding availability of software.

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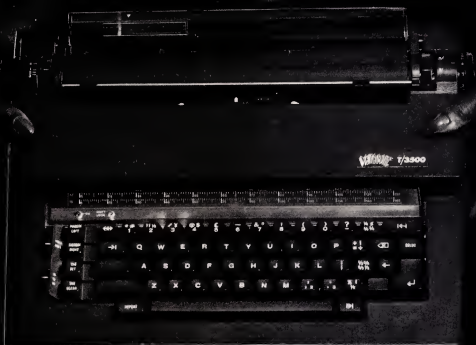
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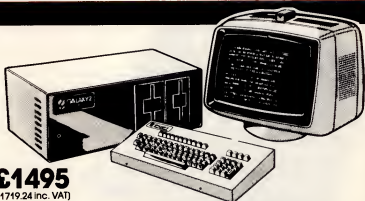
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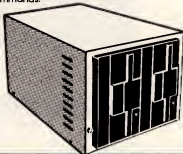
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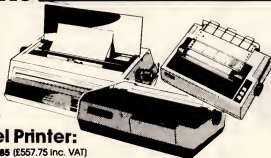
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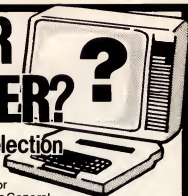
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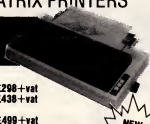
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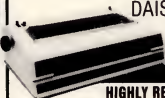
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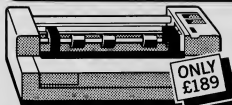
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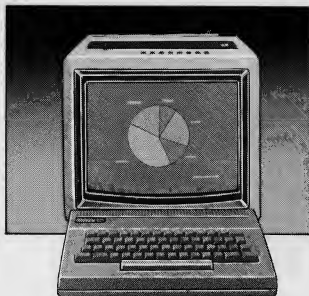
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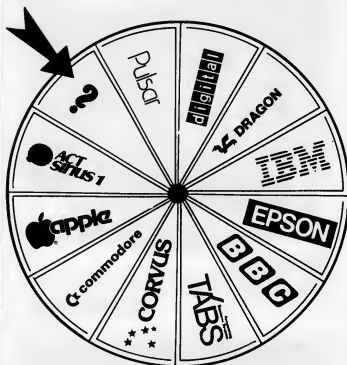
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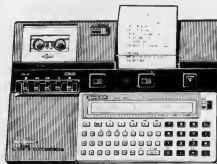
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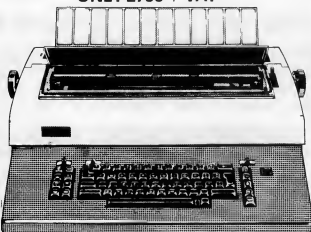
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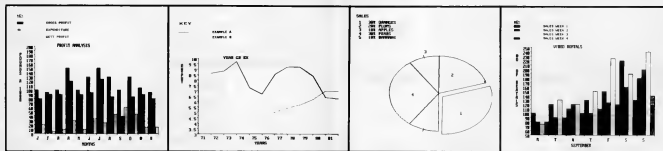
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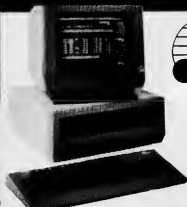
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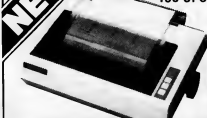
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Parents can be so insensitive. A photo published recently in *Home Computing Weekly* as part of a profile on a software house is captioned 'Hugh Jarre prepares a program for dispatch to a mail order customer'. Perhaps this inauspicious name is actually a jibe by the company's employees at the expense of *HC Weekly* hacks. . . An observant soul in *PCW's* office recently drew the Editor's attention (a difficult task indeed) to a review of the Sharp MZ-80B in March 1983 *MicroIndecision*. This features a photo of the MZ-80A. What's even worse is the contents page, which refers to a review of the MX-80B. Which machine are they reviewing? . . . The Oric-1 appears, according to the company's silly brochure, to be able to run VIC software. Basically, if you look at a certain photo of two kids playing with the machine, you will notice that the screen shows a Pacman look-alike — VICmen. The Oric is even

limiting itself in the picture to 23 columns. How can Oric possibly claim there is 'no comparable competition' to their micro on the one hand, while on the other using another micro's software to advertise it? . . . And still on our latest hobbyhorse — that of simulated screen displays — we hear that the Advertising Standards Authority has brought all the might of the tepid sponge to bear by censoring Sinclair for its orange screen display in the Spectrum leaflet. Perhaps they read *PCW* too (sound of frantic nail-polishing self-applause, etc.) . . . And now the latest computer craze — skinfold callipers. We'll refrain from saying any more because we're too shocked, but in the wake of *Fat is a*

Feminist Issue and anorexia nervosa, as well as Anna Ford's morning callisthenics, comes a keep fit program, *HELP*. You'll stay flabby while your Apple II sheds pounds of lipomatous flesh and replaces it with rippling muscle. . . *PCW's* wastebins have been absolutely clogged recently with boring press releases about Statutory Sick Pay packages. It seems that every small software house in the country has decided it is the only one to have thought of the ideas. And as the SSP system is a singularly stupid one in the first place, it's hardly news to learn that people are trying to lessen already appalling amounts of time-wasting bureaucratic paperwork by computerising it — and therefore (in many

cases) producing twice the amount of paper produced by a manual system. . . Cabin cleaners on flight PA125 on 16 March from Heathrow to San Francisco were amazed at the unusual number of copiously filled airskid bags dotted about the 'plane. The explanation for this lies neither in the bumpy ride nor the awful swill Pan Am distributed in place of food. Neither was it the large amounts of booze consumed in an airborne bacchanalia by the many micro industry figures on their way to the West Coast Faire. No, the blame for the cleaners' extra workload rests on the traumatic sight of Guy Kewney dressed in a sleeveless pink vest waving his armpits in people's faces. . . Finally, for those who are really 'in the know' (hard luck if you aren't), here's a naughty little puzzle for you. Who accompanied the Queen on a tour of Silicon Valley recently? Her Majesty, of course. . .

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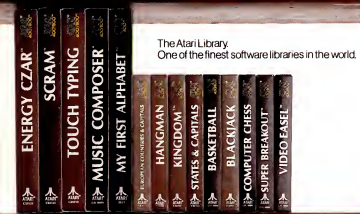
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